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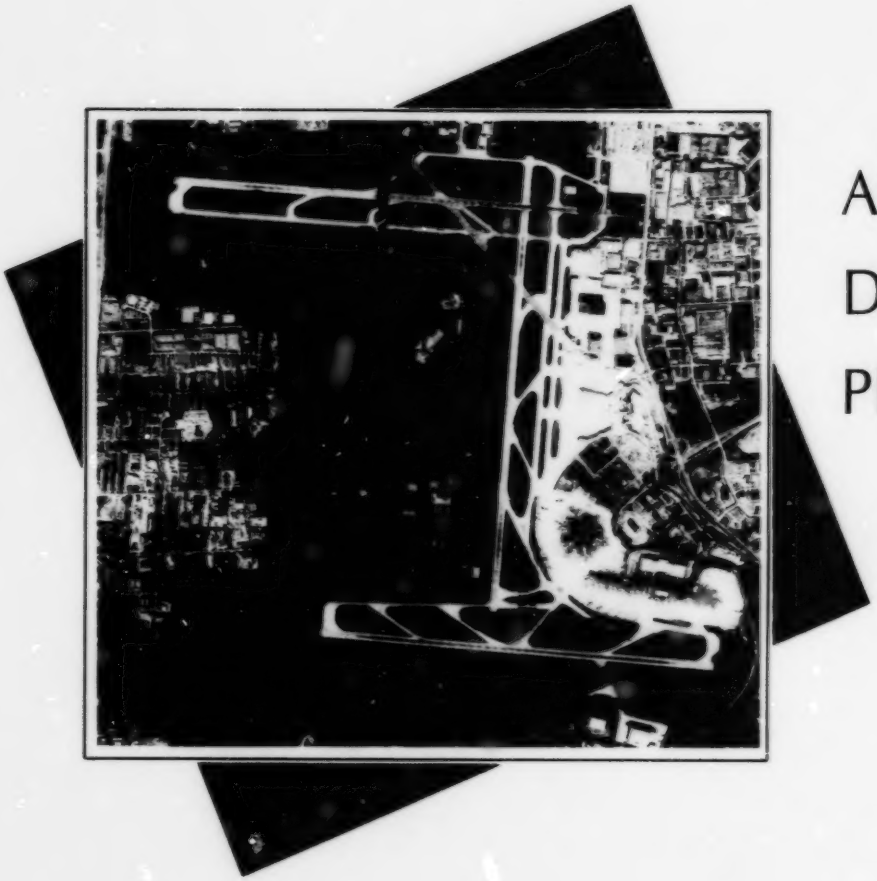
Lester B. Pearson International Airport



AIRSIDE DEVELOPMENT PROJECT

ENVIRONMENTAL IMPACT STATEMENT SUMMARY

1991

TP 10675E

Canada

AIRSIDE DEVELOPMENT PROJECT

ENVIRONMENTAL IMPACT STATEMENT SUMMARY

TP 10675E

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Introduction

Lester B. Pearson International Airport (LBPIA) is Canada's busiest and most important air transportation facility. It is the focal point for local, regional, provincial and national aviation. It is also a major generator of economic activity for southern Ontario. *(Figure 1).*

From the modest inauguration of Malton Airport in 1938 with two hard-surfaced runways and a grass strip, LBPIA now ranks among the 20 busiest airports in the world. More than 60 airlines connect to over 300 destinations through LBPIA. It handles more passenger traffic than the next three busiest Canadian airports together, namely Vancouver, Dorval and Calgary.

Business, personal and leisure travellers as well as shippers depend on an efficient operation at LBPIA. Because it accounts for one third of Canada's air passenger traffic and is the national "hub", problems at LBPIA are not restricted to the local area. They ripple outward disrupting the activities of travellers and shippers across the nation.

Between 1970 and 1988, passenger movements increased from 6.4 million to 20.7 million and aircraft movements grew from about 175 thousand to 350 thousand. Despite this rapid growth, no additions to the runway system have been made in close to twenty years.

In the late 1980s, a buoyant economy and the economic regulatory reform of the aviation industry resulted in dramatic traffic growth at LBPIA. Between 1984 and 1988 aircraft movements grew by over 35%. This growth, coupled with a continuing

Figure 1
REGIONAL SETTING

lack of consensus on airside infrastructure (runways and taxiways) expansions, led to congestion and delay problems; conditions that were further compounded by a shortage of air traffic controllers.

By late 1988 the problems had become so severe that southern Ontario's reputation as a desirable place to visit and conduct business was in jeopardy. Access to the region from other Ontario communities and other provinces was impaired. Transport Canada introduced a number of short term measures to manage the demand but recognized that a more permanent solution was required. The search for a solution began with a series of ministerial consultations to gain perspective on the problem. In the spring of 1989, meetings were held with provincial, regional and municipal government leaders, ratepayers, business associations and other special interest groups. In August 1989, a number of short term measures, and medium and long term proposals for addressing the aviation needs of southern Ontario were introduced. These are described in a report entitled "Aviation in Southern Ontario: A Strategy for the Future".

There are two main elements to the strategy. First, in the medium term, LBPIA will remain the major airport for the area and will be developed to its optimal capacity. Second, to meet longer term needs, other area airports will be developed to fulfil their own roles and to accommodate activity that cannot be handled at LBPIA.

Three major planning initiatives were started: an examination of the feasibility of expanding LBPIA's airside infrastructure; preparation of a revised master plan for LBPIA; and formulation of an area plans to determine the long term role for the surrounding airports and Pickering lands.

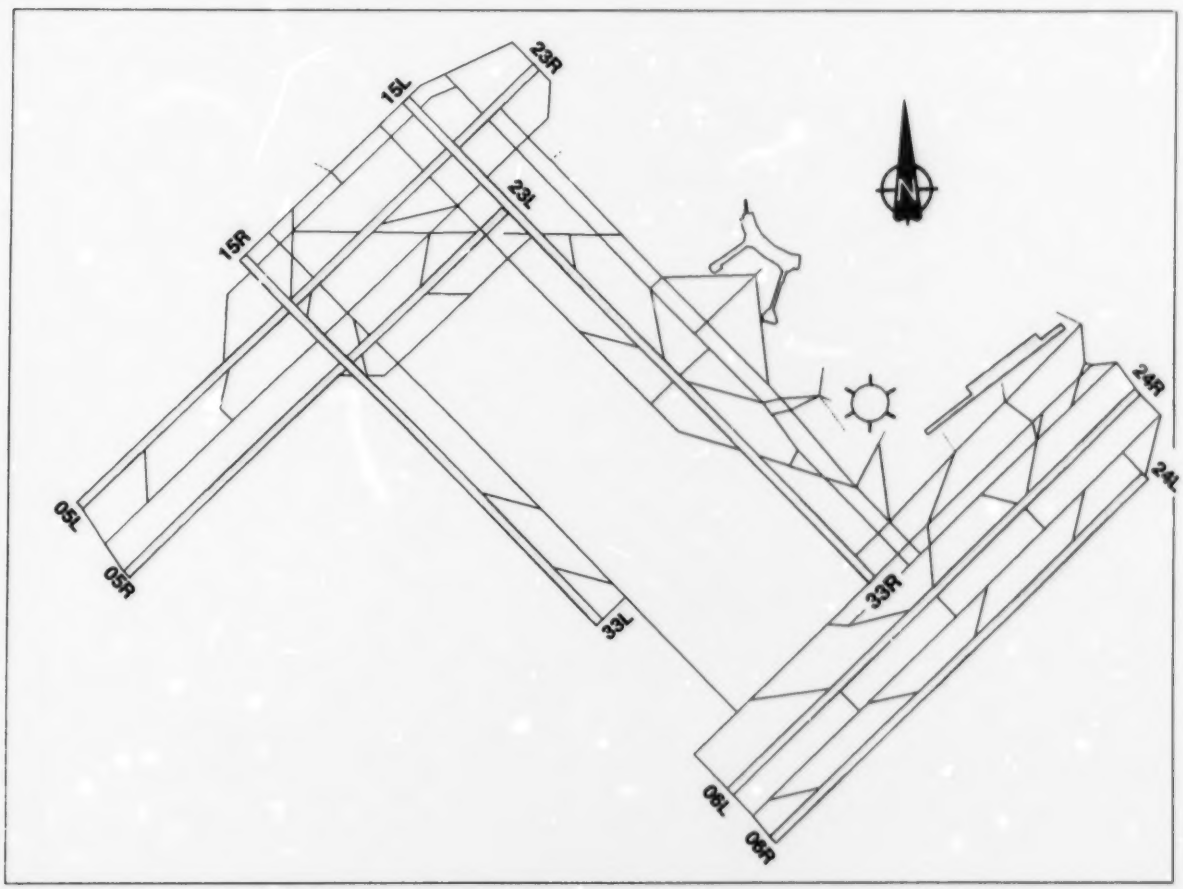

Figure 2
PROPOSED RUNWAYS

Recognizing the potential environmental impacts of the strategy, a formal review through the Environmental Assessment and Review Process was begun. A panel was formed in November 1989. Scoping meetings were held in March 1990 to identify areas of concern to the users and those affected by the operation of LBPIA. In August 1990, the panel issued guidelines to Transport Canada for the preparation of an environmental impact statement (EIS). The guidelines identify the information the panel expects regarding the project and its potential impact. In April 1991, Transport Canada tabled the Environmental Impact Statement with the panel. This document offers an overview of the EIS and related studies.

More than thirty technical studies have been conducted to examine the engineering, environmental, social and economic issues. These studies underlie Transport Canada's proposal to achieve the optimal capacity of LBPIA through the addition of three runways: two in the east-west direction to increase the overall capacity of the airport by about 30%; and one additional runway in the north-south direction to increase the airport's capacity when wind conditions preclude the use of the east-west runways. The increase in crosswind capacity is about 40%. It is proposed to use this new runway primarily for arrivals and during the 5% of the time when operations are restricted to the north-south direction *(Figure 2)*.

This proposal best balances the technical, environmental, social and economic factors. Every reasonable effort has been made to limit the impact on those who could be disadvantaged by the proposal.

Background

The following chronology traces the history of LBPIA and the origins of the Airside Development Project which is the subject of this Environmental Impact Statement:

- LBPIA was established as Malton Airport in 1938, with two hard surfaced runways, a grass strip and a converted farmhouse for a terminal.
- Steady increases in passengers and air traffic required various facility improvements through the 1950s and 1960s. Terminal 1 was completed in 1964 and the initial phase of Terminal 2 opened in 1972. Operations in Terminal 3 began in February 1991. The current three-runway configuration was completed by the early 1970s.
- The first master plan for LBPIA was released in 1967 and in August 1968, expansion plans for LBPIA were announced. By December the decision was reversed in response to opposition from area residents and municipalities. This prompted studies to identify the location for a new Toronto International Airport. A site north of the Town of Pickering was chosen and supported by the findings of the 1974 Airport Inquiry Commission. As there was strong opposition from local groups, the provincial government decided not to provide the required roads and services to the new airport and planning was suspended in 1975.
- As a result of this reversal, Transport Canada produced the Malton Contingency Plan (1975), a second Master Plan (1982) and a Master Plan Update (1986). Each study recommended operational initiatives and physical improvements to the LBPIA airside to increase the capacity of the existing three-runway system. Throughout this period, concern was consistently expressed that the demands for more air travel would ultimately require significant increases in airside capacity at LBPIA.
- The federal and provincial governments undertook studies in 1976 to review the potential of alternative modes of transportation to relieve ongoing pressure at LBPIA. It was concluded that rail, bus and road systems would be too costly and/or provide too low a level of service to offer relief.
- Beginning in 1984 an overhaul of the economic regulatory structure governing national transportation began and culminated in a white paper entitled 'Freedom to Move'. It was based on the principles of less economic regulation, more reliance on competition and market forces and an open economic regulatory process. These changes were incorporated into the National Transportation Act in 1987. In the aviation sector they led to better levels of service, and significant innovation in the transportation industry. Of particular relevance to LBPIA was the shift towards hub and spoke operations, and the rapid growth of turbo-prop commuter service to the regional "spoke" communities.
- Growth in aircraft movements between 1984 and 1988 reflected the strength of southern Ontario's economy and the success of economic regulatory reform. Unfortunately, coupled with the prolonged hiatus in airport expansion, this growth resulted in greatly increased airside congestion and delay. To effectively address this long standing problem, Transport Canada, following extensive consultation with local stakeholders, announced the "Strategy for Aviation in Southern Ontario". It requested that the Minister of Environment carry out an assessment of the strategy's proposals to expand the airside capacity of LBPIA.
- In August 1990, following a series of scoping workshops the panel issued its guidelines to Transport Canada. This Environmental Impact Statement represents Transport Canada's response to these guidelines.

Airport Setting

LBPIA is located 25 km from Toronto's business core in the heart of the vibrant and economically vital southern Ontario region. It is centrally located within the national and North American air transportation network, making it arguably Canada's most important "hub" airport.

About 6 million people, or more than 60% of the province's population, are concentrated in the southern Ontario economic region, including almost 4 million people in the greater Toronto area. This area consists of Metropolitan Toronto and the Regional Municipalities of Durham, York, Peel and Halton.

Ground transportation links to business and residential centres of south and central Ontario are provided by nine major highways *(Figure 3)*, local and regional roadway systems and public transit.

LBPIA is, in its own right, a major contributor to the strength of the regional economy. In 1987, LBPIA operations generated 56,000 jobs, with $1.8 billion in wages, $3.8 billion in business revenue and $630 million in taxes to various levels of government.

Local Urban Setting

The local community around LBPIA, includes the Cities of Mississauga, Brampton, and the Town of Caledon in the Regional Municipality of Peel; the Cities of Etobicoke and North York and four other municipalities in Metropolitan Toronto; the Town of Vaughan in the Regional Municipality of York; and the towns of Halton Hills and Milton in the Regional Municipality of Halton. Due to their proximity to LBPIA these communities experience the most direct benefits and greatest impact of airport operations.

The highly diversified land use in the neighbourhoods surrounding the airport includes residential, commercial and industrial development.

To assist local communities in land use planning, Transport Canada has published an operational policy "Land Use in the Vicinity of Airports" (TP1247E, 1989). Regulations made under the Aeronautics Act provide specific direction to municipalities on building heights, waste management sites, and the protection of signals from the airport's electronic equipment. Development in noise impacted areas is governed by a "Land Use Compatibility Table", issued by the provincial Ministry of Housing.

Local Natural Setting

LBPIA is located in the watersheds of the Mimico and Etobicoke Creeks. Covered by approximately 1,200 ha of inactive fields, mowed grassland, and cultivated cropland, the airport lands provide habitat for a diversity of wildlife and plant species. However, the overall quality of natural habitat in the vicinity of the airport has been steadily decreasing over time due to intensive urbanization and airport operations.

The water quality in the local streams has been seriously degraded by increased storm runoff and industrial discharges from the progressive urbanization of the area. Terrestrial habitat also has

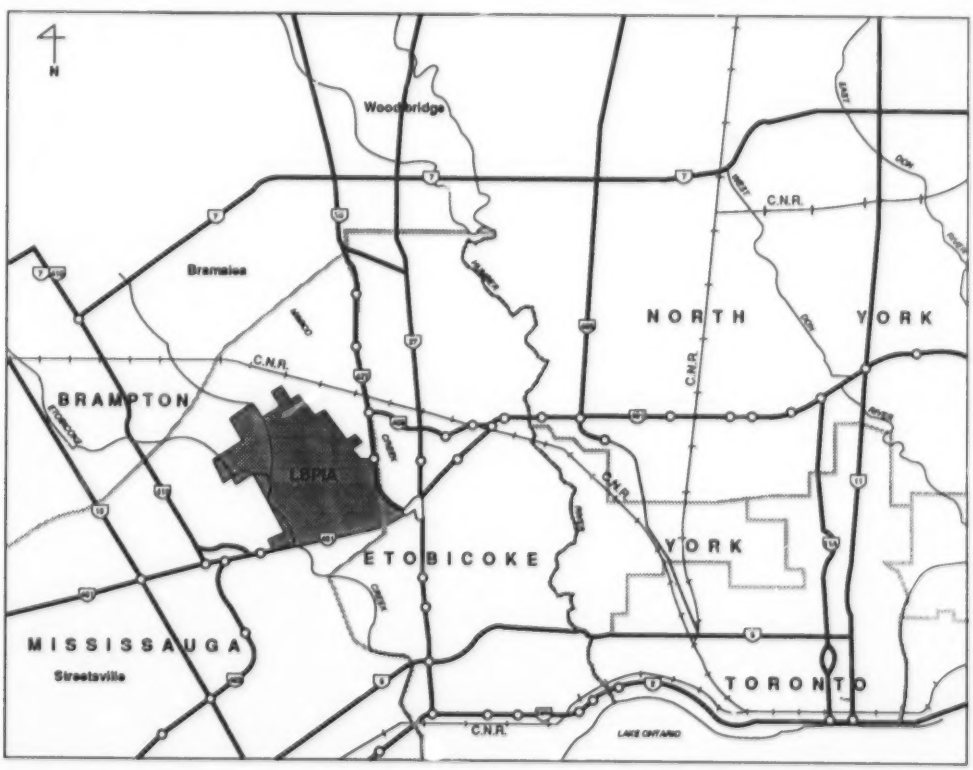

Figure 3
TRANSPORTATION NETWORK

been steadily disappearing, and the remaining areas linked by stream corridors are increasingly being cut off from each other as land becomes developed.

While the natural resource objective for LBPIA is to sustain the natural environment as much as possible, this objective must be secondary to the objective of ensuring the safety of airport operations. This is particularly true for the need to minimize the danger of bird strikes.

Project Need

Ensuring that Canada's most important airport continues to provide an acceptable level of service to the region and people of Canada has become a significant challenge. Steadily increasing demand for air travel services has not been met with a proportionate increase in the supply of airport airside capacity in southern Ontario. This has resulted in airport congestion and significant delays to the regional and national air traffic system.

Runway Capacity

Efforts to maximize the airside capacity of LBPIA without adding runways resulted in a 20% increase in capacity between 1979 and 1989. Initiatives included:

- construction of additional taxiways
- introduction of new runway operating configurations and Air Traffic Control (ATC) procedures
- implementation of a ban on certain incompatible aviation segments (such as training and recreational flying) from the airport and the exclusion of others during busy periods.
- greater reliance on the use of fully independent parallel runway operations

To balance the flow of arrivals within the available runway capacity, control procedures were introduced in 1984. While this traffic management measure provided a safer, more efficient operation, it has done little to resolve the delays experienced by travellers and the aviation industry at LBPIA.

Runway capacity has continued to be the bottleneck. Limitations of the existing taxiway system, some ATC equipment, airway constraints, and the general shortage of ATC staff have precluded the attainment of the airport's rated capacity.

In December 1988, because of a shortage of air traffic controllers and other airside system inadequacies, an operating "cap" of 70 hourly aircraft movements (arrivals or departures) and a supporting slot reservation system was reluctantly established for the airport. This extreme measure to regulate the availability of slots was taken in the interest of eliminating aircraft congestion. In the months leading up to this decision, individual aircraft delays in excess of two hours were not uncommon. Although increased to 76 movements per hour in September 1990, the "cap" has unfavourable impacts. There has been a 30% drop in General Aviation (non-air-carrier) activity since its introduction and air carriers have had to forestall service improvements they would have liked. Most seriously impacted however have been the passengers who cannot travel at their preferred times or make convenient connections and the regional economy which suffers with inefficient transportation.

The overall capacity of the existing three-runway system can be marginally increased by changing to the taxiways, adding high speed exits, and constructing holding bays to some runways. These improvements, together and with a full complement of air traffic controllers are defined as the "Base Case". They could possibly increase the airport's capacity to a maximum of 96 movements per hour under visual weather conditions and 80 movements per hour in inclement weather when instruments are required. This capacity however, still falls far short of meeting the aircraft movement forecasts.

With strong cross winds, all traffic must shift from the two east-west runways to the single north-south runway which has a capacity of only 50 movements per hour. Although the requirement for using this runway could be limited to as little as 5% of the year, due to wind conditions its capacity is totally inadequate to meet current activity. The result is extreme congestion, delay and national system dislocation.

Passenger Forecasts

Future passenger traffic at LBPIA is expected to grow at an average annual rate of approximately 3.5% over the next twenty years *(Figure 4)*. Air passenger traffic is forecast to increase from 21 million passengers per year to more than 33 million by the end of the century. By 2011, air traffic is expected to reach 43 million passengers, over twice the current level of activity. It is recognized that the passenger growth rate will gradually slow over the next two decades as the industry matures. However, even under the most pessimistic assumption that the passenger growth drops to 2.3% per year or half the rate of growth of the past decade, LBPIA would still be used by nearly 30 million passengers annually by the end of the century.

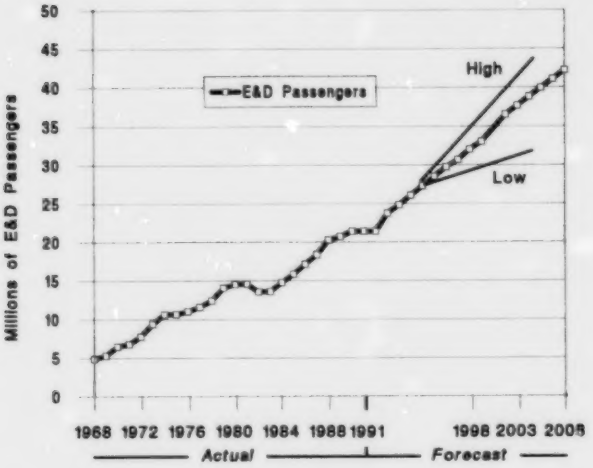

Figure 4
PASSENGER MOVEMENTS

Aircraft Movement Forecasts

Growth in aircraft movements is expected to be more modest in the next several years *(Figure 5)*. Average annual air carrier aircraft movements, representing 85% of total traffic at LBPIA, are forecast to grow at a rate of approximately 2.3% per year, less than the corresponding 3.5% growth rate for passengers, and less than the 3.0% per year growth rate experienced over the past decade.

There are several factors which are expected to temper the growth of aircraft movements:

- rate of growth in air passenger demand will slow;
- major and regional carriers are expected to increase their average aircraft size as market development permits the introduction of larger aircraft on many routes;
- carriers are improving management techniques to increase productivity and hence profitability;
- the spectacular growth in local/regional air carrier movements over the past few years is expected to ease as the substitution of smaller turbo-prop aircraft for larger jet aircraft (a one time shift) is completed; and
- General Aviation activity is forecast to grow at a constrained rate of less than one percent per year assuming that continued priority will be given to the air carriers.

Despite these moderating influences air carrier aircraft movements are forecast to increase significantly in absolute terms, from the present base of almost 350,000 movements per year to more than 400,000 movements annually by the end of the century and exceed 500,000 movements per year, by the end of the planning period in 2011. The extent of the shortfall in annual terms between capacity and the projected number of aircraft movements is shown in *Figure 6*. Based on the forecasts it is clear that by the early 1990s, aircraft movements at LBPIA will be significantly constrained if capacity is limited to that attainable with the present three-runway system. Without immediate measures to expand airport capacity, the problem of delay and congestion will grow.

Translated to daiiy aircraft movements, it is forecast that by 1996, there will be demand for 1440 movements on a typical busy day, growing to almost 1800 by 2011. On an hourly basis, it is forecast that there will be demand for 111 movements in the peak hours in 1996, and up to 139 by 2011 - well in excess of the 96 maximum movements that can be provided under ideal conditions in the peak hours through optimization of the current parallel runway system. As no additional capacity can be coaxed from the single cross wind runway, the severe congestion and delays which are now experienced when wind conditions require operation of this runway will grow worse.

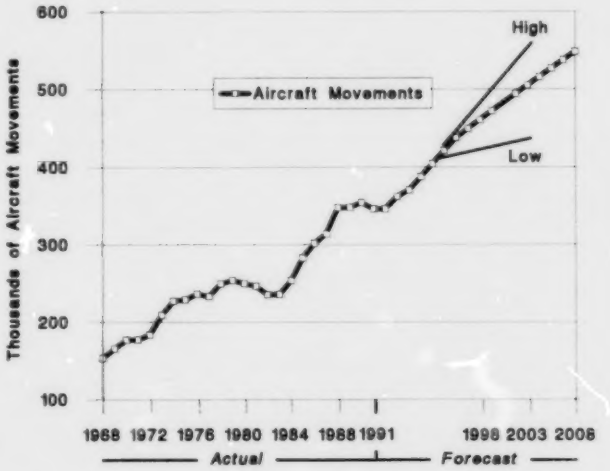

Figure 5
AIRCRAFT MOVEMENTS

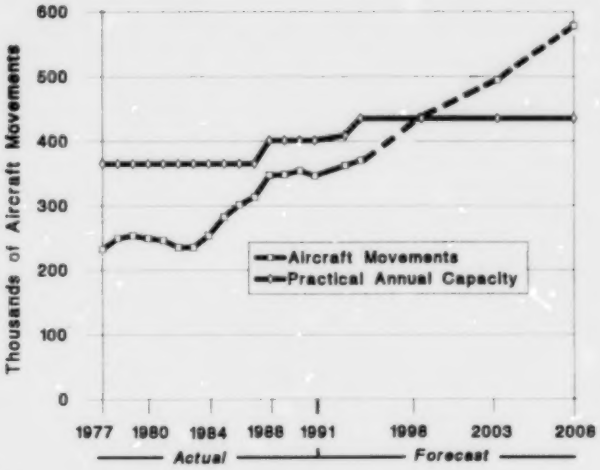

Figure 6

AIRCRAFT MOVEMENTS vs. CAPACITY (Base Case)

The Economic Cost of Capacity Shortfalls

The magnitude of the present and forecast delays and congestion at LBPIA are clear signals of the inadequacy of the air transportation infrastructure. This situation results in additional costs for aircraft operators in terms of fuel and other operating expenses as well as lost opportunities. Passengers are penalized in the form of lost productive work time, valued leisure activities and higher out-of-pocket costs.

When winds shift and prevent the use of the two east-west runways, airport capacity is limited to the 50 hourly movements attainable with the single north-south runway. The result of such a sudden, pronounced drop in capacity is severe disruption of scheduled air traffic movements, including lengthy delays and cancellations. The disruption is not confined to LBPIA but impacts other airports in the national and regional network.

The costs of delay and disruption associated with the Base Case for three milestone years are shown in *Figure 7*. Reductions in this delay and disruption would result in a more efficient use of transportation resources.

Impact of Capacity Shortfalls on Spoke Communities

LBPIA serves as a regional hub to many communities in Ontario, including Kingston, London, North Bay, Sarnia, Sault Ste. Marie, Sudbury, Timmins, Thunder Bay and Windsor. These and other communities depend on LBPIA to gain access to the national and international transportation network. It is estimated that 55% to 65% of air passengers travelling on flights on the spoke routes have the Toronto area as their original or final destination. For the remainder, LBPIA is a connection point for destinations beyond. Between 60% and 70% of air passengers on the spoke routes are business travellers who need prime-time flights to coincide with the hours of a business day or require minimum connection times between flights.

In the absence of additional capacity, LBPIA would have to continue to rely on demand management along with its inherent negative consequences for spoke communities. Air service to these communities would be squeezed into less desirable operating times that fail to mesh with the large carriers' connecting flights or lost entirely when capacity is severely constrained by weather.

Passenger levels would be affected as the levels of traffic and service deteriorated and competition is reduced.

Figure 7

COSTS OF DELAY AND DISRUPTION ASSOCIATED WITH THE BASE CASE (Constant 1990 $ Millions)

Year	Delay	Disruption
1996	156.9	82.2
2001	287.9	96.6
2011	580.7	141.8

Alternatives to the Project

A wide variety of measures has been considered to deal with the capacity shortfalls at LBPIA. These include:

1. **Improving Efficiency of the Current Facilities:** It has been claimed that LBPIA is inefficient when compared to other world airports. A review of data however indicates that LBPIA compares very favourably these airports. Significant improvements in operating efficiency have been made in recent years and will continue to be made. The Base Case against which options of new runways can be evaluated, assumes all potential improve

ments have been made and there is a sufficient number of air traffic controllers.These improvements involve changing taxiways, adding high speed exits and constructing holding bays to some runways. While this will enable LBPIA to achieve the maximum output from its three-runway system, this capacity falls well short of projected requirements.

2. **Using Pricing Mechanisms:** The demand for facilities could be managed through pricing mechanisms. By increasing landing fees or other charges, the growth of airport demand could be slowed or diverted to off peak periods. International experience has shown that the effectiveness of these measures is fairly limited. Airport fees constitute a small share of air carrier operating costs and the business air travellers, who predominate at LBPIA, are relatively price inelastic. Pricing can be effective in discouraging smaller aircraft. However in doing so the regional economy and particularly the spoke communities suffer. Pricing measures have a role as short term traffic management tools. While they have been introduced at LBPIA in the form of a minimum landing fee with a peak period surcharge as a short term traffic management measure, they are not considered as medium or long term solutions.

3. **Diverting Traffic to Other Airports:** A number of airports are often mentioned as having the potential to relieve the pressure at LBPIA. They include: Hamilton Airport, Toronto Island Airport, Oshawa Airport, Buttonville Airport, and Downsview Airport. In order to encourage air carriers to shift operations away from LBPIA, Hamilton and Toronto Island airports have received significant investment in infrastructure in recent years. The fact remains however that airspace conflicts with LBPIA, lack of ground transportation to the Toronto market, consumer preference for LBPIA's wide variety of flight times and destinations, and the inefficiencies of splitting an airline's operations between two airports preclude these sites from offering any appreciable airside capacity increase to southern Ontario in the medium term. The environmental implications of expanding traffic and facilities at these sites could also be significant and would require a detailed assessment.

4. **Limiting Access to LBPIA:** Administrative means could be used to allocate available capacity to some pre-determined upper limit. As a short term temporary measure capping traffic is effective in regulating demand and minimizing wasteful delays. A cap of 70 movements per hour (subsequently raised to 76) and a slot reservation system were introduced at LBPIA in 1988. As a long term permanent solution, limiting access has a very negative impact on the local economy. The economies of regional communities also suffer as their access to LBPIA is also capped. Limiting access is very difficult to administer equitably and would negate the advantages enjoyed through economic regulatory reform. For these reasons limiting access to LBPIA for other than low productivity traffic, is rejected as a medium to long term solution to the problem.

5. **Constructing a New Airport in the Toronto Area:** A new airport could either complement LBPIA or replace it entirely. A replacement airport would eliminate the problems faced by airlines and other airport users when required to split operations between two sites. This would however, be more costly than constructing a less substantial new airport to augment the capacity offered by LBPIA. The alternative of a new international airport for the Toronto area was the subject of intense study two decades ago and a land reserve was retained at Pickering for this purpose. While this reserve ensures that Toronto's long term airport needs are safeguarded, advancing construction is not a solution for meeting the region's medium term airport capacity needs. Modern aircraft technology has now made it possible to expand LBPIA with less environmental impact than was previously possible. A new airport is a long term alternative that will be considered along with other airports in the Area Plan being prepared to address the long term aviation needs of the region.

In summary, none of the above alternatives separately or together are able to resolve the current capacity shortage in southern Ontario during the medium term. Adding runways at LBPIA is the only solution that would ensure adequate capacity until the turn of the century. Major decisions will soon be required on the long term future of LBPIA and the means of accommodating the various aviation segments serving southern Ontario at other area airports or airport sites once the ultimate capacity of an expanded LBPIA is reached. Only after the economically and environmentally justifiable limits of expansion to LBPIA are determined, will it be possible to assess the long term roles other regional airports are required to play in meeting southern Ontario's aviation needs.

Airside Development Options

The Options

Additional runways are required to increase airside capacity to relieve the current congestion and to accommodate the forecast growth in aircraft movements.

A wide range of development options were examined which had the potential to resolve the two distinct capacity problems with the existing runway system, namely:

1) providing additional runway capacity in the primary wind direction (east/west) to accommodate growth in aircraft movements for at least the period 1996 - 2007; and

2) providing additional runway capacity in the crosswind direction (north/south) to relieve the congestion and delays which occur when the primary runways cannot be used due to adverse weather conditions.

Initially all possible runway alignments which were substantially within or adjacent to the existing airport property were considered. A preliminary feasibility screening reduced the number of individual potential candidates to six; three in each direction and parallel to the existing east/west and north/south runways. These are:

In the east/west direction:

Option 1.1 offset 408m (1338 ft) southeast of existing Runway 06L-24R

Option 1.3 offset 762m (2500 ft) southeast of existing Runway 06L-24R

Option 4.4 offset 335m (1100 ft) southeast of existing Runway 06R-24L

In the north/south direction:

Option 2.1 offset 365m (1200 ft) southwest of existing Runway 15-33

Option 3.1 offset 1067m (3500 ft) southwest of existing Runway 15-33

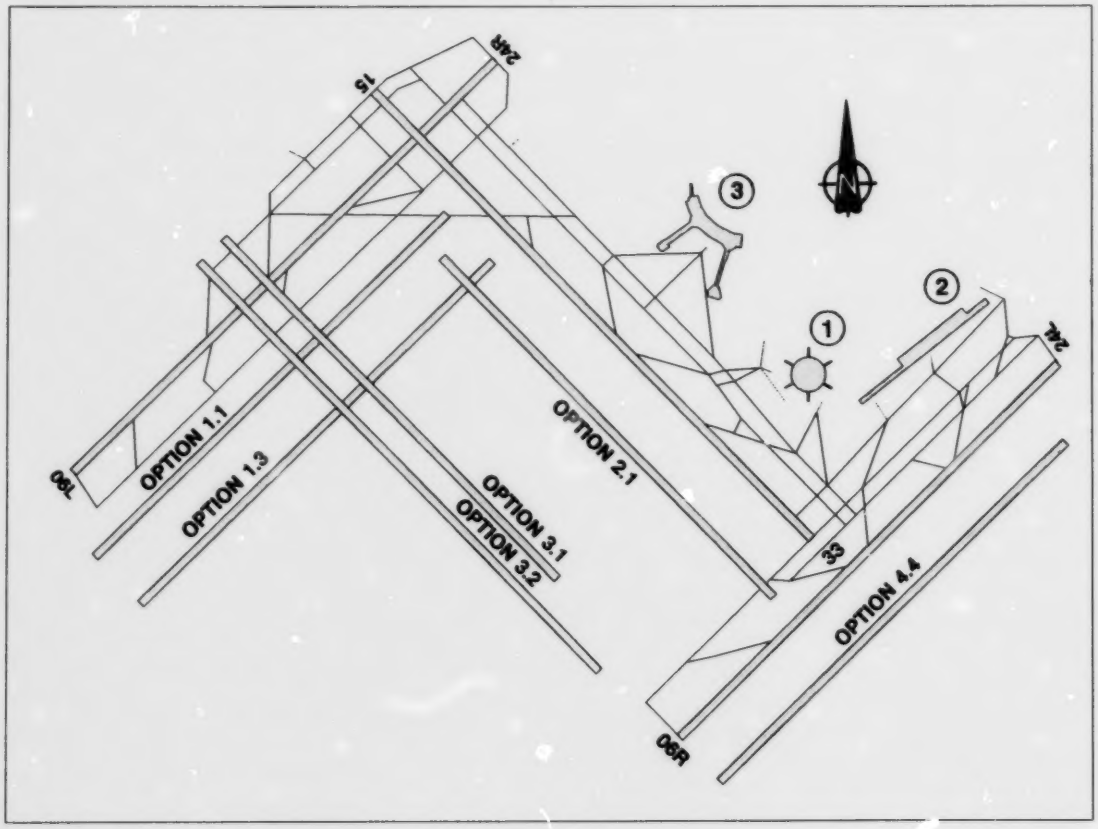

Figure 8
RUNWAY OPTIONS

Option 3.2 offset 1311m (4300 ft) southwest of existing Runway 15-33

These alignments are shown in *Figure 8*.

The incremental capacities obtained by either Option 1.1 or Option 4.4 are minimal. However, studies indicated that a significant increase could be achieved by a combination of both options. Construction of these two runways in combination with the existing east/west runways would create two pairs of parallel runways. One pair would be located in the northern part of the airport and a second pair would be located in the southern part. This is known as the "quad" configuration. Although one pair could operate independently of the other pair, each runway within a pair would be dependent on the activities of the other.

A runway length analysis was conducted to determine the most appropriate runway lengths. It was concluded that acceptable lengths would be in the range of 2591m to 2743m (8500-9000 ft). The potential of short runways aimed at serving primarily turbo-prop aircraft was considered in the course of this analysis. This "stub" runway option was rejected because of the very limited capacity increase. There were also safety concerns posed by the need to weave traffic when departures are segregated by aircraft size rather than destination.

The Selection Process

The runway development options were then subjected to a detailed analysis and screening to select the best solutions to the two capacity problems at LBPIA. Because of the different nature of the two capacity problems, the analysis and comparison of options in each direction were carried out separately.

Options were first ranked in terms of their technical performance (i.e. their ability to resolve the capacity problems in a safe, efficient and cost effective manner), and then were examined for environmental or socio-economic factors which might result in changes to that ranking. A detailed set of criteria was developed to provide the basis for comparison of the options. These criteria are shown in *Figure 9*.

The Selected East/West Option

The "quad" configuration consisting of runway Options 1.1 and 4.4 was selected as the preferred development option in the east/west direction. Although this option represents neither the highest capacity nor the lowest capital cost solution, it did rank among the top alternatives from all perspectives, and is considered to present the best balance

	Criteria
TECHNICAL	**1.0 Technical-Operation**
	1.1 Capacity/Thru-Put
	1.2 Runway System/Demand Balance
	1.3 Delays or Schedule Disruption
	1.4 Ground Manouvering Simplicity
	1.5 Efficiency
	1.6 Operations and Maintenance Cost
	2.0 Technical - Implementation
	2.1 Capital Costs
	2.2 Implementation Time
	2.3 Land Acquisition
	2.4 Operational Interference
	2.5 Potential for Future Development
ENVIRONMENTAL	**3.0 Environment - Noise**
	3.1 Noise Exposure Profile Net Changes
	3.2 Noise Impact on Suseptable Institutions
	4.0 Environment - Air Quality
	4.1 Air Quality Changes
	5.0 Environment - Water Quality/Quantity
	5.1 Compliance to Standards and Water Quality Objectives
	5.2 Impact on Flood Plain
	5.3 Quantity and Quality Control Requirement
	5.4 Groundwater
	6.0 Environment - Natural
	6.1 Terestrial Habitat
	6.2 Aquatic Habitat
	6.3 Changes in Wildlife Corridors
	6.4 Rare Species
	6.5 Potential for Bird Strikes
SOCIO-ECONOMIC	**7.0 Socio-economic - Economic Considerations**
	7.1 Net-User Benefits
	8.0 Socio-economic - Social Impact
	8.1 Land Use
	8.2 Residential Property Value
	8.3 Commercial Property Value
	8.4 Quality of Life (Community Well-Being)
	8.5 Quality of Life (Individual Well-Being)
	8.6 Level of Passenger Service
	8.7 Waste Management
	8.8 Utilitites and Community Services
	9.0 Socio-economic - Historical Considerations
	9.1 Heritage and Archaeological Potential

Figure 9
RUNWAY OPTIONS EVALUATION CRITERIA

between achieving technical effectiveness and limiting environmental and socio-economic impacts.

The Selected North/South Option

In the north/south direction, Option 3.1 is the option that best balances all factors. Although it provides less capacity than Option 3.2, the noise and natural environment impacts are less severe.

Project Description

Runways

The proposed runway system consists of the three existing runways plus three new runways:

New Runways Parallel to the Existing East-West Runways:

05R-23L	2591 m (8500 ft) in length, offset 408 m southeast of existing 06L-24R[1] (redesignated 05L-23R)
06R-24L	2591 m (8500 ft)in length, offset 335 m southeast of existing 06R-24L (redesignated 06L-24L)

New Runway Parallel to the Existing North-South Runway:

15R-33L	2591 m (8500 ft) in length, offset 1067 m southwest of existing 15-33 (redesignated 15L-33R)

The configuration of the proposed runway system and associated taxiways is shown on *Figure 10.*

Capacity Improvements

Because the three new runways cannot be used independently due to their lateral separation, adding three new runways to the three existing runways would not result in a doubling of aircraft movements. Nonetheless, these new runways would provide significant improvements in operating capacity. During normal weather conditions, when the airport is operating in the east-west direction, the two new runways could increase the capacity to approximately 126 movements per hour. This represents a 31% improvement over the Base Case estimate of 96 movements per hour.

During adverse weather conditions when the airport is operating in the north-south direction (5% of the time), the hourly capacity would be approximately 70 movements per hour, an improvement of about 40 percent.

Runway Operations

East-West Direction

Runways in the east-west direction would be operated as a "quad" system with two dependent parallel runways operating on the south side of the airport (runways 06R-24L and 06L-24R) and two dependent parallel runways operating on the north side (runways 05L-23R and 05R-23L). Within each pair, one runway would be used primarily for takeoffs and the other primarily used for landings *(Figure 11).*

The lateral spacing of more than 2,743 metres (9,000 feet) between the north and south runway complexes would allow each close-spaced pair to operate fully independently of the other close-spaced pair. However, because of the close lateral spacing within each pair, operations on one runway would be dependent on operations of the other. Thus, each runway could be used for either takeoffs or landings but could not be used for simultaneous arrivals or simultaneous departures.

Because of existing obstructions runway 05R could only be used for arrivals. Runway 23L could only be used for departures.

The normal operation of runway 06R-24L would be for arrivals in both directions. This procedure would minimize the noise impact on residential communities.

North-South Direction

The new runway operating in the north-south direction would primarily be used during the 5% of the year when wind conditions prevent airport operations on the higher capacity east-west parallels, or when operational contingencies force its use.

Because of the lateral spacing of 3,500 feet (1067 m), the two runways could operate semi-independently, with the proposed runway dedicated

[1] Runways are officially designated by their geographic orientation rounded to the nearest 10 degrees. Hence, a runway with a heading of 61 degrees off magnetic north would have the designation 06 at its south west end and 24 at the north east and the overall designation 06-24.

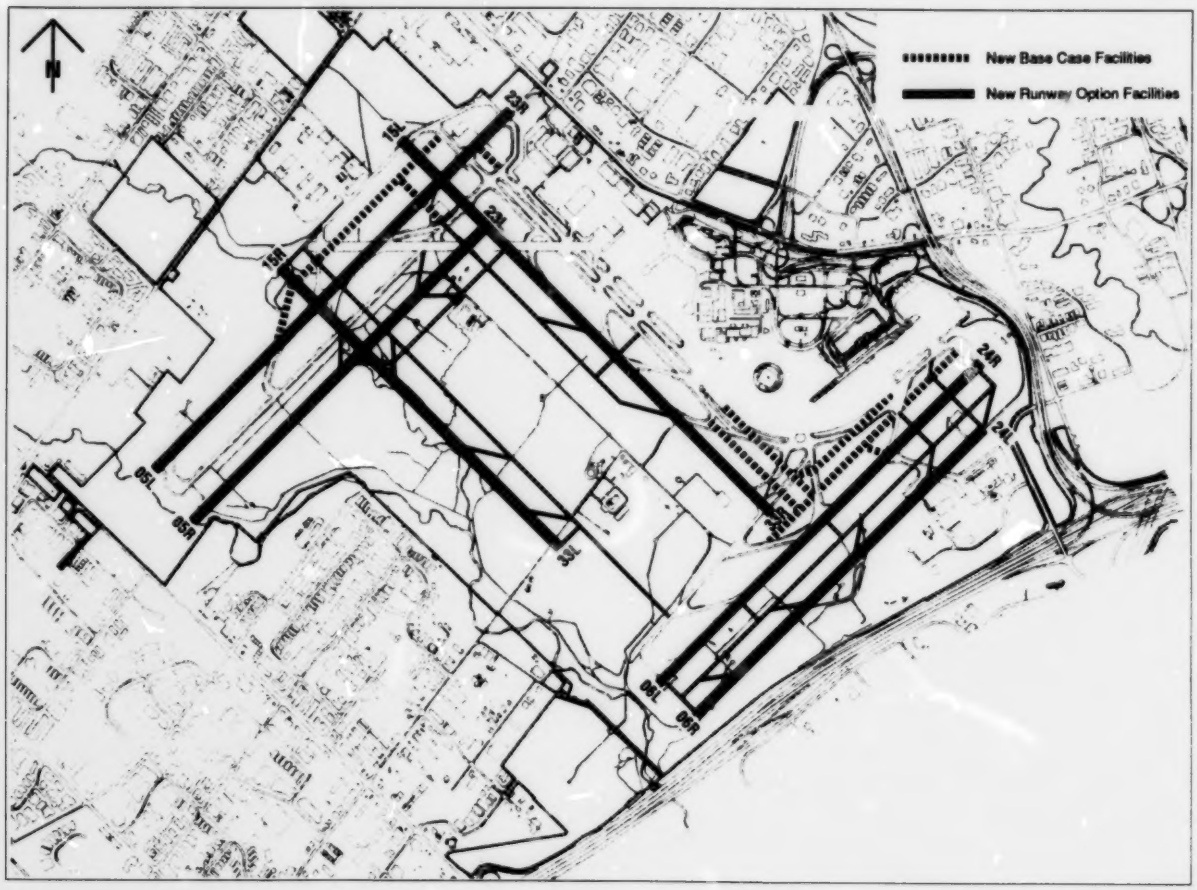

Figure 10
PROPOSED RUNWAY CONFIGURATION

primarily to arrivals in both directions, and the existing runway used primarily for departures.

Road Adjustments

The addition of new runways, and the reconfiguration of the airport infield would result in the need to alter several roads. The sections of Britannia Road on airport property would be redesigned and tunnelled under the new north-south runway. As well, lighting adjustments would be required on Highway 401 and on new flight approaches over Dixie Road, Derry Road and Renforth Drive and a minor realignment of Renforth Drive would be necessary near Highway 427.

Improvements to other off-site roadways and transit systems may be necessary in the future. These will be examined during the preparation of the Master Plan. Specific plans would not be prepared until the on-going federal/provincial transportation study for LBPIA and the surrounding area is complete.

Construction Program And Phasing

Subject to the decision made following the environmental assessment, implementation is proposed to begin in 1992. Detailed design, site preparation, and construction of runways, roads, and other facilities could be completed within approximately four years. The total cost of constructing the three runways (inclusive of taxiways, lighting, facility relocation, real estate costs and navigational aids) is estimated to be $666 million in constant 1990 dollars.

Net Benefits Of Additional Runways

The addition of two east-west runways would result in a more efficient use of the resources

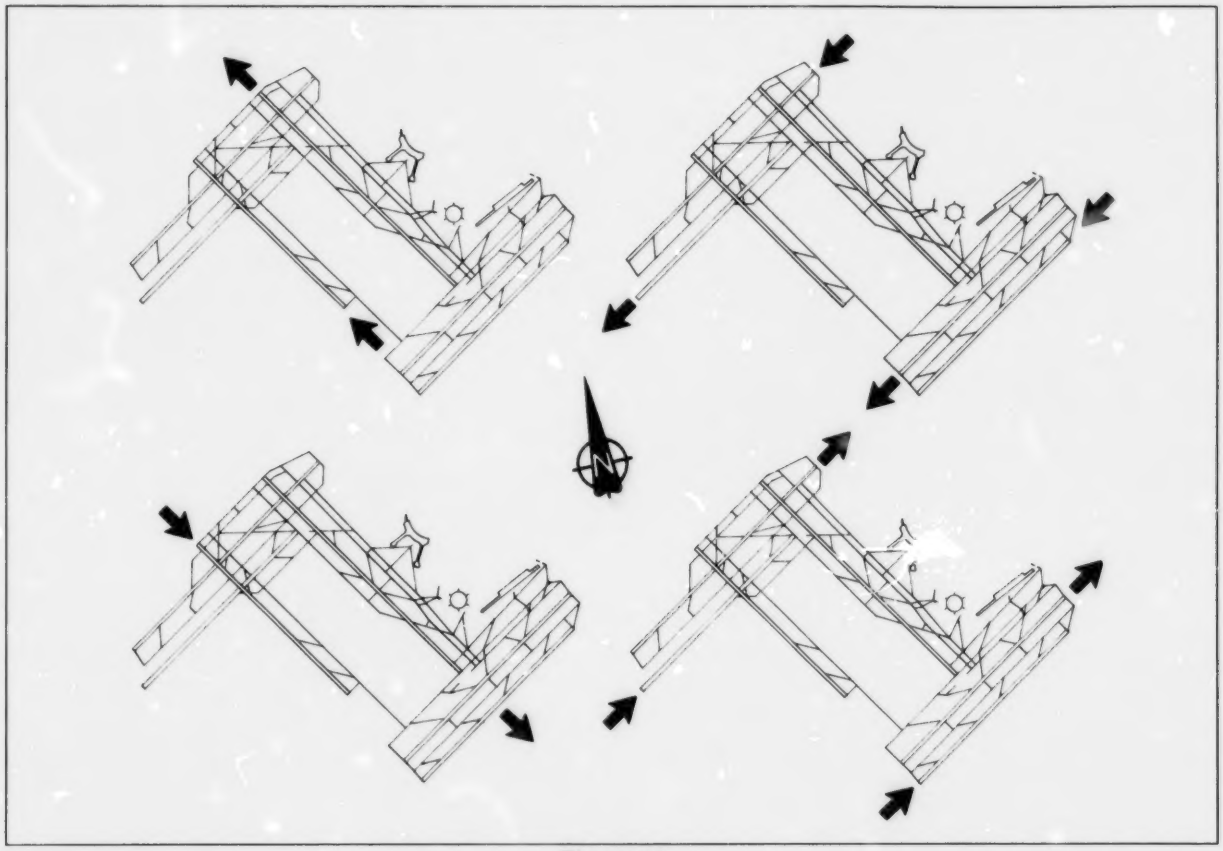

Figure 11
NORMAL RUNWAY OPERATIONS

employed in providing transportation services and a productivity gain for the economy at large. The additional runways would yield benefits in two ways; first, the passengers and aircraft currently using LBPIA would experience less delay and second, the increased capacity could accommodate additional users.

Figure 12 compares the annual capacity with additional east-west runways to forecast annual movements. The estimated cost of delay without additional east-west runways was compared to that with additional runways to determine the benefits of additional east-west runways.

The value of the reduction in delay is compared to the costs of providing these runways (capital, operating and maintenance and noise) to yield a net benefit of $985 million in 1990 present value dollars *(Figure 13)*.

The addition of a second north-south runway would increase capacity in that direction from 50 to 70 movements per hour and some of the disruption costs could be averted. The estimated cost of disruption without an additional north-south runway was compared to that with an additional runway to determine the benefits of this element of the proposed airside development project. The value of the reduction in disruption when compared to the costs of providing the additional runway yields a net benefit of $110 million in 1990 present value dollars.

The Balanced Solution

Any solution to the two capacity problems at LBPIA which would result in significant benefits to air travellers and businesses associated directly or indirectly with the airport, would have some adverse impact on the communities surrounding the airport. The most significant challenge was to find a solution which best balances the need for additional capacity with the need to minimize social and environmental impacts.

With the two additional east-west runways, the air industry and the travelling public would gain some much needed airside capacity (30% increase). However, they would forego a potential greater increase which could be gained by constructing a single, more widely spaced east-west runway. In the north-south direction a more widely spaced runway operated independently could provide significantly more crosswind capacity than the one proposed.

The surrounding communities, on the other hand, would benefit from a much more environmentally acceptable configuration with the selected runways. The close spacing and constrained operation of these runways would confine the noise impacts of additional operations close to pre-development levels much more effectively than the higher capacity options.

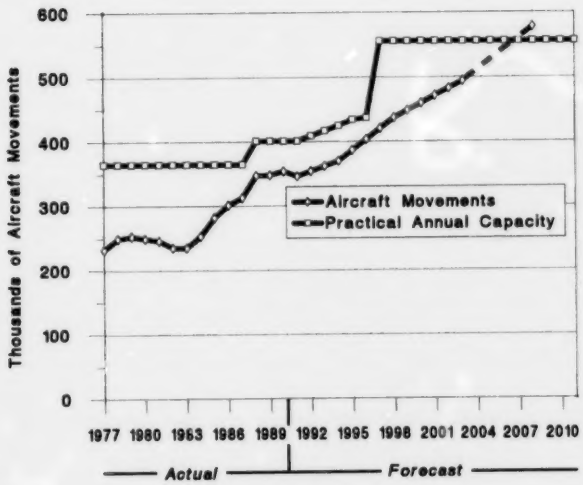

Figure 12

CAPACITY vs FORECAST AIR CARRIER MOVEMENTS

The impacts of the project on the natural environment within the airport site would also be significantly reduced, while still achieving a viable increase in capacity, by keeping the proposed runways as close to the existing ones as possible .

The location and operating limitations of the recommended runways therefore represent the best compromise between the needs of the industry and travelling public, and the concerns of the surrounding communities.

BENEFIT COST ANALYSIS RESULTS
(present value $ 1990 millions)

	06-24	15-33
BENEFITS		
Delay Savings to Existing Users	1,327.2	–
Consumer Surplus for New Users	15.1	–
Disruption Savings	–	279.4
Total Benefits	1,344.3	279.4
COSTS		
Capital Expenditures	326.7	157.2
Operating and Maintenance Costs	26.8	11.7
Social Costs-Noise	5.1	0
Total Costs	358.6	168.5
NET BENEFITS		
(Benefits Less Costs)	985.6	110.5
BENEFIT-COST RATIO	3.8	1.7
INTERNAL RATE OF RETURN	29.3%	16.4%

Figure 13

Environmental Conditions and Socio-economic Impacts

In recognition of public concern about additional runways, a comprehensive examination of the potential impact on the natural and socio-economic environments resulting from the proposal was conducted by Transport Canada. In accordance with the guidelines issued to Transport Canada in August 1990, a number of social and environmental areas were examined. They include:

Environmental Conditions

1. Noise
2. Air Quality
3. Stormwater Quality/Quantity
4. Natural Environment

Social, Heritage and Economic Impacts

1. Land Use
2. Economic
3. Noise Annoyance
4. Health
5. Archaeology and Heritage
6. Quality of Life

The Environmental Conditions section provides background information on each of the four important environmental factors. It summarizes the measurements and the modelling used to forecast expected changes resulting from the proposed development. The impact of these changes on the community are outlined in the Social, Cultural and Economic Impacts section.

The impact analysis not only examines potential direct and indirect environmental effects that might result from additional runways, but also (a) examines ways in which impact levels could be reduced through mitigation, and (b) estimates residual impacts (the impact remaining) following the implementation of mitigation measures.

Environmental Conditions

1. NOISE

Background

One objective of the Airside Development Project is to develop and operate the airport in a manner such that noise exposure contours for future years remain , as much as possible, within the contour that was used by municipalities to plan their communities. This is known as the 1996 Noise Exposure Projection (1996 NEP) and was prepared in 1984.

The Noise Exposure Forecast (NEF) system, was used to project the total amount of noise accumulated in an area over a representative 24 hour period. Noise contours for 1996, 2001, and 2011 were prepared for the three runway Base Case and the proposed six-runway configuration. To put these in perspective, the actual NEF contours for 1990 were also prepared.

To complement the cumulative assessment of the NEF system, actual noise levels were recorded at 32 locations around the airport. The Integrated Noise Model was then used to project several noise parameters at these locations including:

1. the maximum noise of a single over flight, (Lmax);
2. the average noise level over a given period, (Leq);
3. the average noise level over a day adjusted for night time flights, (Ldn); or
4. the noise level that was exceeded a specified percentage of the time.

The NEF and Ldn are "cumulative" noise metrics that have been widely accepted throughout the world. They provide a measure of the total noise exposure (including loudness, duration, total number and time of day) at a given location over a 24 hour period. Night time operations are weighted to indicate they are more intrusive. A rough rule of thumb suggests that NEF equals Ldn minus 35. A comparison between equivalent NEF and Ldn levels is shown in *Figure 14*.

The provincial "Land Use Compatibility Table" permits new residential development up to the 35 NEF contour level. Some municipalities have applied more stringent regulations and do not permit new housing above the 30 NEF.

Results

The actual 1990 NEF contours are shown in *Figure 15*. *Figures 16 to 18* show the noise contours for the proposed option for the years 1991, 2001 and 2011

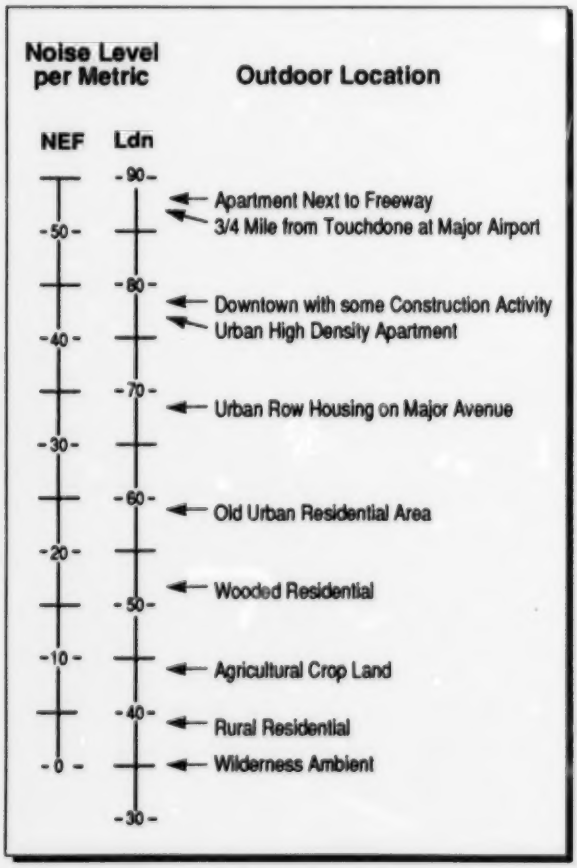

Figure 14

NOISE LEVELS AS EXPRESSED BY NEF/LDN.

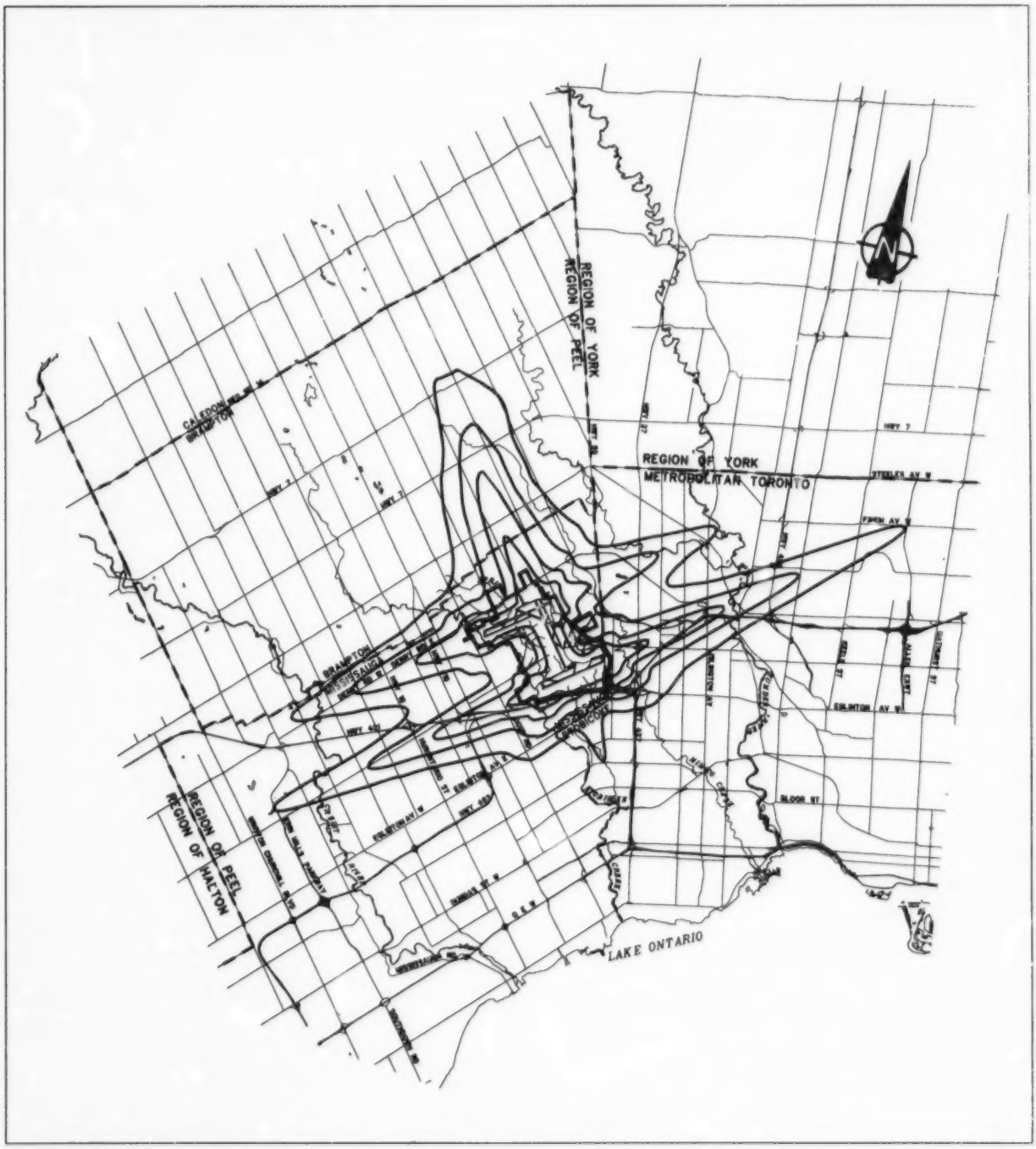

Figure 15
1990 ACTUAL NEF CONTOURS

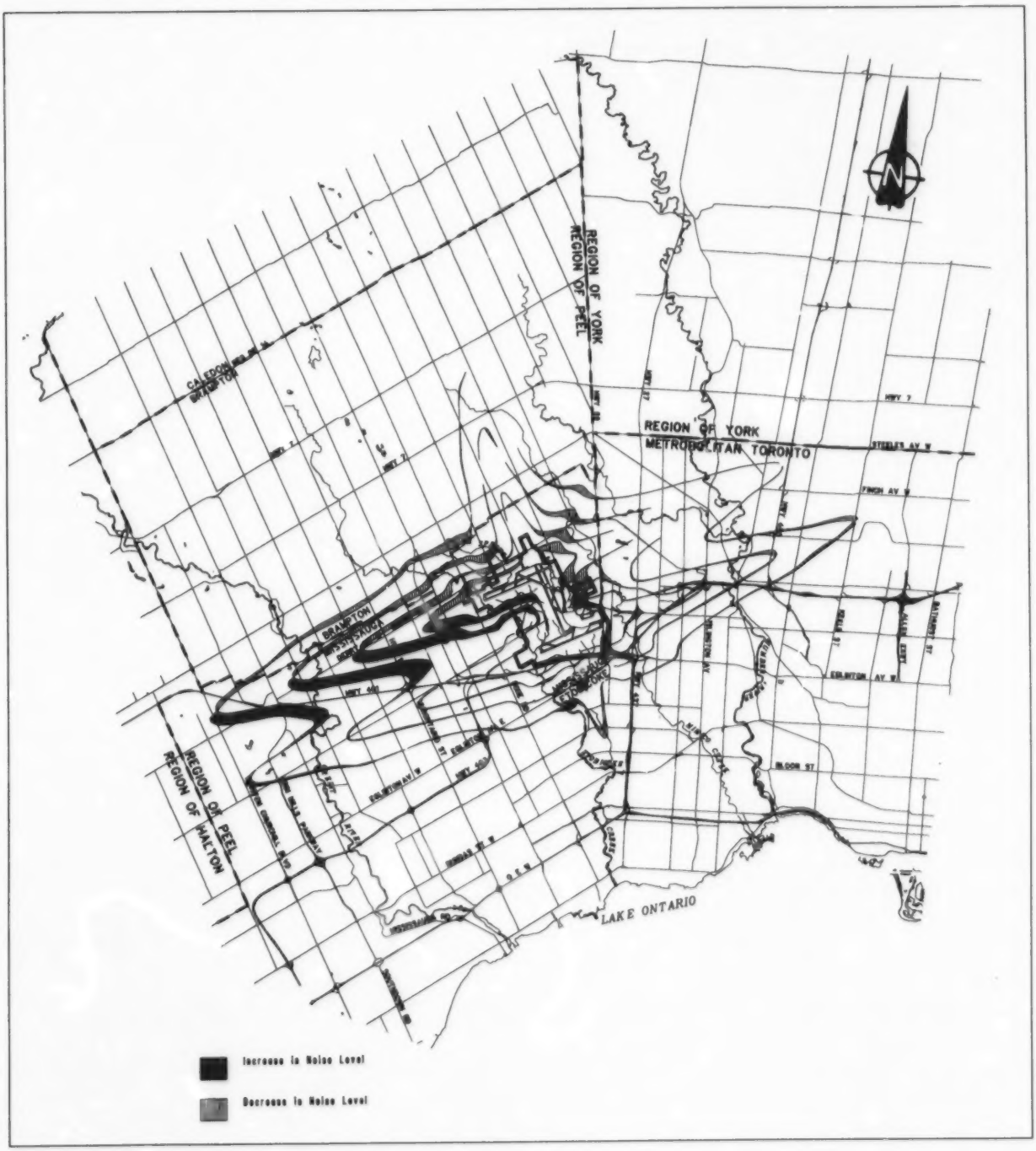

Figure 16

1996 NOISE LEVEL CHANGES BETWEEN THE BASE CASE AND PROPOSED OPTION

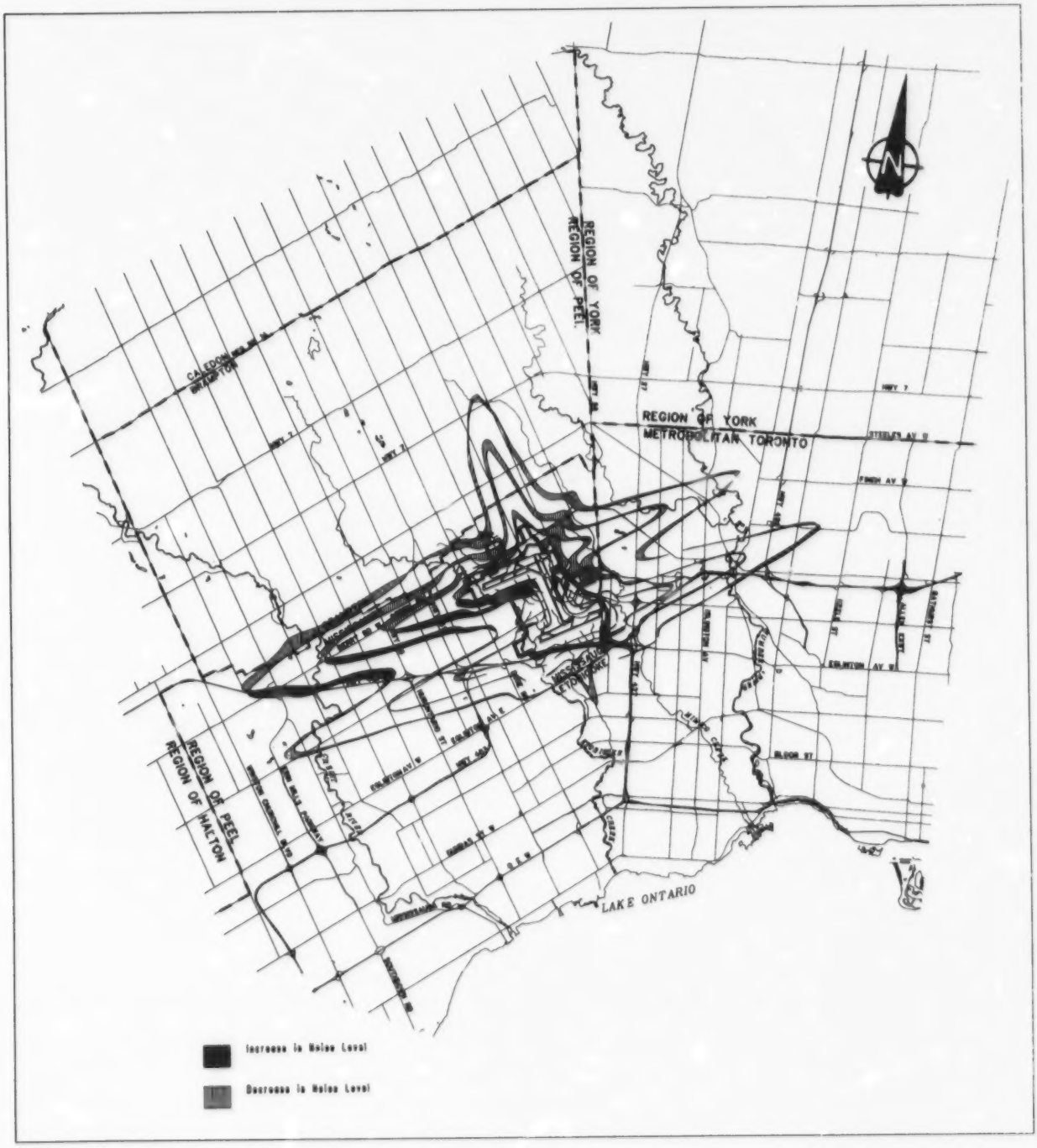

Figure 17

2001 NOISE LEVEL CHANGES BETWEEN THE BASE CASE AND PROPOSED OPTION

Figure 18

2011 NOISE LEVEL CHANGES BETWEEN THE BASE CASE AND PROPOSED OPTION

superimposed on the contours for the Base Case. Two conclusions are drawn:

1. The similarity between the Base Case and the proposed option contours suggests that the NEF (and Ldn) values would not be expected to differ by more than 3 dBA for any location affected by airport operations. That is to say, the addition of three runways would have little incremental affect on noise impact.
2. After an initial increase between 1990 and 1996, the contours for 2001 and 2011 would be expected to shrink to sizes less than those for 1990. *Figures 19 and 20* summarize the area and impacted population by NEF contour zone over time for each development scenario.

Noise levels resulting from operation of the east-west "quad" runway system would be marginally higher for residents located in north

	25-30 NEF	30-35 NEF	35-40 NEF	40+ NEF	TOTAL
1990	86	52	26	18	182
1996 - 3 Rwy	94	60	30	21	205
1996 - 6 Rwy	94	60	32	21	207
2001 - 3 Rwy	75	44	18	14	151
2001 - 6 Rwy	75	41	17	14	147
2011 - 3 Rwy	86	43	19	15	163
2011 - 6 Rwy	70	38	16	13	137
1996 NEP	130	64	23	18	235

Figure 19

TOTAL AREA WITHIN EXPOSURE ZONE (Sq km)

	25-30 NEF	30-35 NEF	35-40 NEF	40+ NEF	TOTAL
1990	121,107	31,334	5,966	1,159	159,566
1996 - 3 Rwy	145,905	35,829	4,055	363	186,152
1996 - 6 Rwy	155,042	32,858	3,706	434	192,040
2001 - 3 Rwy	91,748	15,252	2,605	111	109,716
2001 - 6 Rwy	85,067	12,049	2,049	112	99,277
2011 - 3 Rwy	101,259	15,668	2,629	151	119,707
2011 - 6 Rwy	69,605	10,442	1,434	81	81,562
1996 NEP	209,724	30,523	2,998	554	243,799

Figure 20

TOTAL POPULATION WITHIN EXPOSURE ZONE

central Mississauga, along the 06R-24L runway, particularly in the initial years of operation. These increases, primarily due to the traffic gain made possible in the east-west direction, would be less than 3 dB.

When compared to the official 1996 NEP prepared in 1984, the new 1996 contours prepared for the Base Case and the proposed option are larger in the east-west directions but smaller in the north-south direction. This variance is primarily due to a greater use of the east-west runways, a condition which is expected to continue to 1996 and beyond. It is expected that all areas affected by noise in the north-south direction would experience lower levels. Very few residents would be exposed to "new" noise.

By 2001 the benefits of the proposed option become apparent. The number of residents impacted by noise is forecast to reduce within each NEF contour band. This is explainable in part to the increased ability to accommodate traffic during day time hours. Without additional runways this traffic could progressively flow into the night hours.

By 2011, continued traffic increases would cause minor growth in the 2001 contours. However, they would remain largely contained within the envelope of the 1996 NEP.

The 1990 noise measurement survey verified the shape of the 1990 NEF contours produced by the computer model. The Base Case and proposed options were examined using the Integrated Noise Model (INM). This model is able to calculate several noise descriptors including Ldn. The results are consistent with those suggested by the NEF contours. For all locations in the vicinity of LBPIA, the differences between the Base Case and proposed development when measured in Ldn were generally less than 3dB. The most common difference was either 1 dB or zero. The forecast maximum noise levels under the Base Case or proposed option for 1996 or 2001, were not significantly different from those measured in 1990.

It is estimated that in 1996, about 15 schools in the Base Case and 13 schools within the proposed development would be within the 30 NEF contour. No hospitals would be within this contour. Studies conducted in 1990 at 4 schools have identified that construction techniques and materials have in some cases resulted in reductions in sound level across the walls, in excess of 40 dBA. Within the main school buildings therefore, the learning environment was found to be unaffected. However, portable classrooms are usually inadequately insulated in relation to land use guidelines governing buildings at these NEF levels. The study established that the learning environment within portables was significantly affected by aircraft overflights. At schools close to the 35 NEF, outdoor recreational activities could also be periodically affected requiring raised voices and some momentary stoppage of activities. Hospital activities at four surveyed hospitals were found to be unaffected by airport operation.

Discussion

For 1996, there are very few differences in the shape or size of the noise contours between the proposed development option and those for the existing three-runway layout. This is due to two factors:

First, under both scenarios, the number of large jet aircraft which dominate the noise environment remain the same. Second, by primarily confining the noisier operations to the runways closest to the center of the airport, the impacted areas are almost unchanged.

The reduction in overall noise levels predicted over the period 1996 to 2001, for both the proposed option and the Base Case, is attributable to the expected increased percentage of quieter Chapter 3 aircraft in the future. A comparison between the noise generated by these aircraft and earlier jet aircraft is presented in *Figure 21*.

Between 2001 and 2011, the noise impacts of the proposed option are forecast to become progressively lower than those of the Base Case. This forecast decrease is largely due to the reduction in number of sensitive night operations which would be unavoidable under the three-runway case due to its inadequate runway capacity.

Construction

Certain construction activities might be scheduled at night to minimize the interference with airport operations. As a result, noise generated by construction would be most noticeable after airport operations have ceased. However, noise levels generated by construction are not anticipated to be high enough to significantly affect local residents particularly given the industrial character of the immediate surroundings. Noise levels would be monitored during the construction phase and mitigated where possible.

2. AIR QUALITY

Background

LBPIA is situated in Canada's most urbanized area. It is intersected by a network of major highways and arterial roads and is experiencing increasing

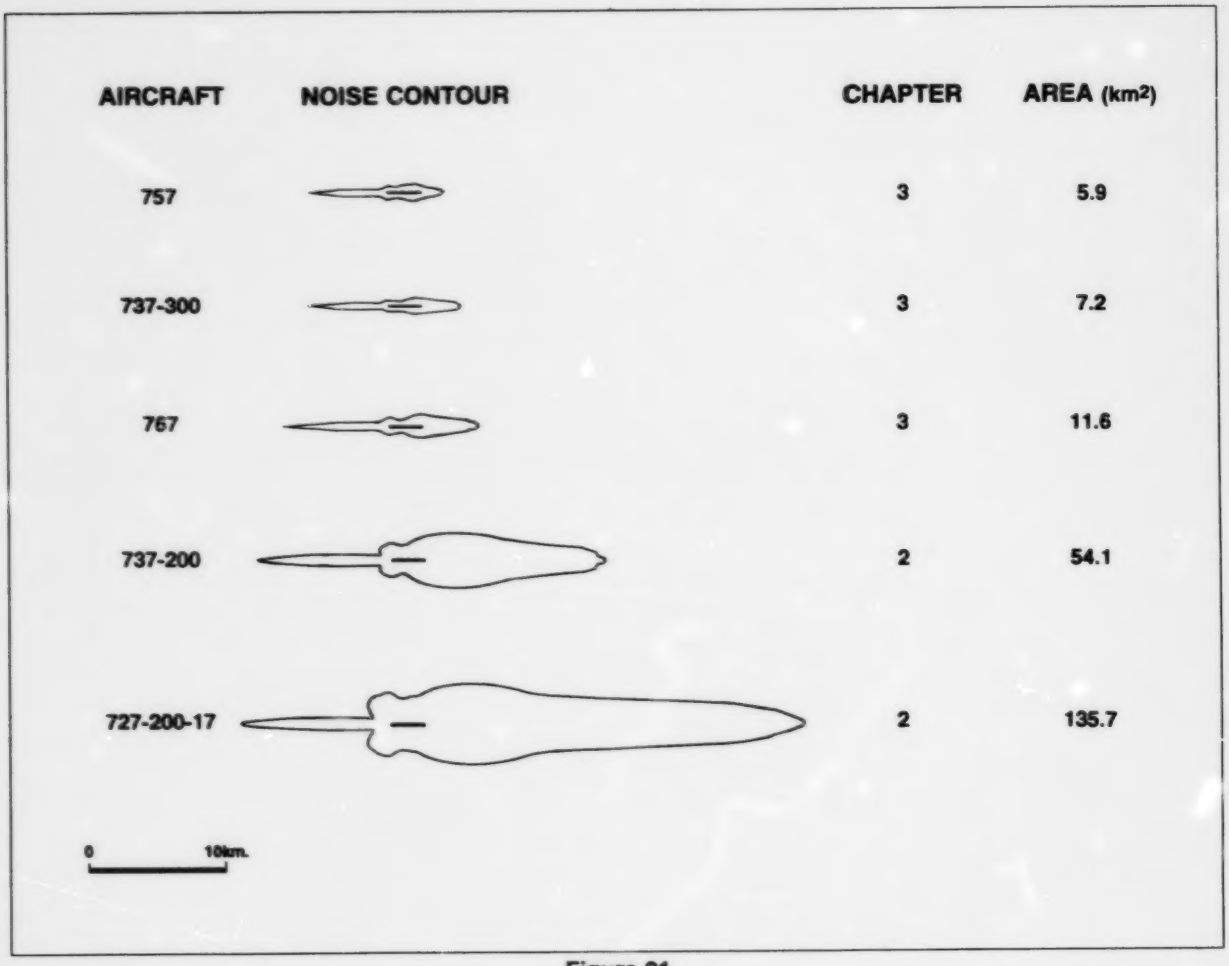

Figure 21

SOUND EXPOSURE LEVEL (85 dBA CONTOUR)

industrialization. Over the years concerns about air quality around the airport and in southern Ontario have grown.

Air quality monitoring has demonstrated that airports are a complex source of air emissions. Most of the emission sources are mobile and the emission characteristics vary considerably by day, week, season and weather.

To quantify LBPIA's contribution to the local air quality, a series of three on-airport air monitoring studies have been conducted since 1978. These studies were recently supplemented by monitoring carbon monoxide (CO) simultaneously at several locations on the airport. Predictions of future emission inventories and pollutant concentrations were made by using the Emission Dispersion Modelling System (EDMS), a model developed for the U.S. Federal Aviation Authority, and the Ontario Ministry of the Environment's Gas Model. Current emissions were modelled for comparison with the monitored results.

Current Conditions

Air quality monitoring at LBPIA has indicated the following trends in air quality as compared to the Federal Air Quality Objectives.

- The maximum measured carbon monoxide (CO) levels did not exceed half of the 1-hour acceptable objective.
- The concentrations of nitrogen dioxide (NO_2) were always below 70% of the objective.

- Ozone (O_3) levels were consistently high relative to the objectives, with summer concentrations tending to be much higher than those recorded during the fall and winter. High ozone levels frequently occurred when other pollutant concentrations and airport activity were relatively low. In addition, the ozone levels measured at the airport were similar to levels measured at other MOE stations in southern Ontario. This indicates that the primary sources of this ozone were off-airport.
- The acceptable objective for particulate matter (PM) concentrations was exceeded between 3% and 18% of the time with no marked seasonal pattern. The PM levels at the airport were similar to those measured at MOE urban monitoring stations.

Emission inventory information *(Figure 22)* indicates that LBPIA is presently responsible for between 1.3% and 10% of the annual pollutant emission within a 7km radius of the airport.

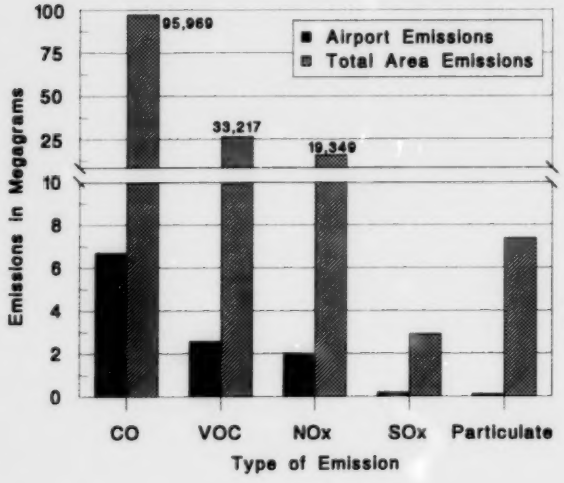

Figure 22

ANNUAL EMISSIONS FOR 1990 FOR LBPIA AND VICIINITY

Modelling

For the east-west runways, the EDMS modelling for 1996 and 2001 indicates emissions from the airport under the proposed option would be less than those for the Base Case. For carbon monoxide (CO), this difference is about 25% and for oxides of nitrogen (NO_x) about 5% in 1996. In 2001, CO would decrease approximately 35% and NO_x by about 10% *Figure* 23 shows predicted change in emissions by pollutant.

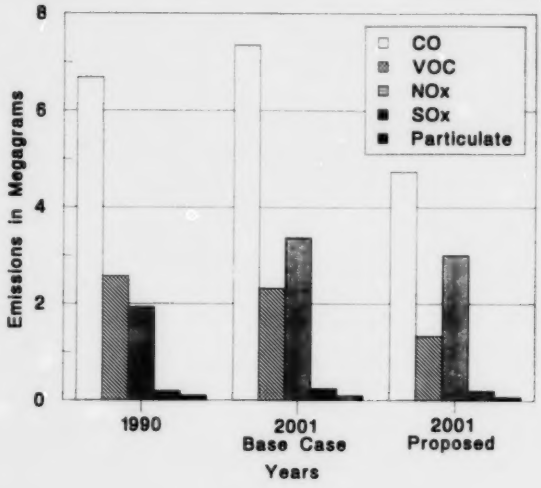

Figure 23

TOTAL ANNUAL EMISSIONS LBPIA FOR 1990, 2001-BASE, 2001-OPTION

The reduction of these pollutants along with a decrease in the emission of total hydrocarbons (72%), carbon dioxide (16%) and total suspended particulates (51%), would reduce LPBIA's impact on odour, visibility and the greenhouse effect.

The contribution of emissions from parallel north-south runways to the local pollution burden is expected to be minimal since they are intended for only occasional operation. The heaviest use would be during adverse wind conditions which force the air traffic from the east-west runways. Since these wind conditions are favourable for pollutant dispersion and the number of flights would be reduced during these times, the effects of emissions would likely be similar to those forecast for the Base Case.

Discussion

Congestion and the need to queue airplanes are major contributors to air pollution as engines are the most inefficient when idling. Airport expansion would provide greater capacity thus reduce queuing. In addition, the introduction of the much cleaner Chapter 3 aircraft will reduce airport-generated emissions.

Construction

During construction of the runways at LBPIA, a particulate matter sampling program consisting of three high volume air samples located around the airport property would be established. The sites would be located upwind and downwind of the immediate construction zones and would monitor suspended particulate matter only. Mitigation measures would be undertaken as required.

3. STORMWATER

Water Quantity/Quality

There are two creeks that could potentially be affected by airport expansion -- Mimico Creek, off LBPIA property but which drains the eastern portion of the site; and Etobicoke Creek which drains a westerly portion of the site. An analysis of the potential impact of the proposed development on these watersheds has been carried out in consultation with the Ministry of Natural Resources and the Ministry of the Environment. The analysis indicates that the impact on the quantity and quality of water expected in both the Mimico and Etobicoke Creeks is not expected to be significant.

Quantity

Higher volumes of surface water runoff would be generated by airport expansion primarily as a result of additional paving. However, little change is expected in the volumes of water discharged into the creeks following the installation of additional stormwater detention storage facilities (ponds). With the addition of these ponds, discharge to the creeks can be maintained at existing levels. Because discharge volumes would be controlled, no stream erosion or flooding problems are anticipated. Flooding would be further controlled through the installation of additional culverts and conveyance channels (ditches).

To prevent flooding and erosion, flows would be monitored. A detention storage facility would be installed if needed.

Quality

The volume of aircraft de-icing fluid (ADF) used as a result of runway expansion would increase proportionate to the increase in air traffic volume. The collection and treatment of glycol is a departmental priority. To mitigate the runoff of increased volumes of glycol into local creeks, ADF applied at the Terminal 3 apron is being drained into a central collection system to be hauled off site for treatment. Planning is presently underway by the air carriers, supported by Transport Canada, to construct a dedicated de-icing pad adjacent to Terminals 1 and 2 which will include glycol collection and recycling facilities. The construction of these facilities will significantly reduce the volume of glycol contaminated runoff from the airport.

Use of runway de-icing compounds would increase as more runways are constructed. However, although the volume of de-icing compound used would increase with the addition of runways, increased concentrations of urea in surface runoff are not expected to be significant enough to warrant treatment prior to discharge. If continuous monitoring indicates the removal of ammonia from the stormwater is required, on-site treatment would be provided or alternative de-icing compounds used.

Aircraft tire rubber is removed from runways using a chemical compound and high pressure water. The quantity of runoff from this process is very small and does not reach the receiving stream. Therefore, there is no existing stream impact and this is not likely to change as a result of implementing any of the runway options.Chemicals resulting from fire fighting training exercises are contained within the training area and are not allowed to enter the airport drainage system. Thus, there is no apparent impact to the receiving stream. Because runway expansion would not displace the training area, no future impact is expected. No additional fire fighting training is anticipated as the result of the additional runways.

Sediment buildup and subsequent washoff from airport lands can result in high concentrations of suspended solids in the receiving streams. The construction of new runways could result in an increase in these concentrations. The stormwater detention facilities (proposed as an integral part of the project) could be employed as sedimentation ponds to prevent the addition of sediments to the creeks. Suspended sediments would be reduced to limits allowed by regulation prior to discharging to the receiving waters.

4. NATURAL ENVIRONMENT

The LBPIA site is located within the Etobicoke Creek and Mimico Creek watersheds, both of which are highly urbanized. Portions of both creeks serve as major stormwater pathways to Lake Ontario and have already experienced extensive modification through channelization, culverts, or bank stabilization.

Approximately 1,200 of 1,700 ha of the LBPIA site remains vegetated. The four main vegetation areas found on-site, include: agricultural lands (180 ha), mowed grass (640 ha), inactive fields (320 ha) and forests (1.7 ha). Paved surfaces associated with

airport expansion would replace approximately 70 ha of vegetation. Primarily affected would be areas of short mowed grass and agricultural fields in the in-field area of the airport property.

The airport lands have been undergoing increased development over the past decades. As air traffic volumes have increased, the management of wildlife, especially birds, on the site has intensified as protection against aircraft-wildlife collision.

Aquatic Fauna

Etobicoke and Mimico Creeks are designated by the Ontario Ministry of Natural Resources (OMNR) as capable of supporting warmwater fishery. No rare species, migratory salmonoid, warmwater spawning runs, or coldwater fish habitat have been identified in the vicinity of the airport. Specific management strategies or tactics have not been identified in the OMNR's Fisheries Management Plan for either the Etobicoke or Mimico Creek.

Environmental impacts to aquatic resources resulting from the Airside Development Project would occur primarily during the construction phase of the development due to the physical alteration of existing watercourses.

Construction of the new runways would require the diversion and realignment of Etobicoke, Spring and No Name Creeks. Temporary impacts resulting from watercourse diversion construction could potentially include:

- some increased suspended solids in the water resulting from runoff
- corresponding deposition of sediment on the streambed
- loss of riparian vegetation
- loss of natural stream morphology
- displacement of existing fisheries habitat and aquatic communities
- disturbance of fish population during sensitive life history stages (e.g. spawning)

Fill and excavation in the Spring Creek floodplain would result in the temporary loss of riparian vegetation which is important for providing bank stability, shade and in-stream cover for fish and invertebrate populations. Once construction is complete and vegetation re-established, long term effects resulting from diversion are not expected.

Longer term impacts on the aquatic community of the local creeks resulting from airport operations could include contamination from surface run-off containing aircraft de-icing fluids, etc., which would be toxic to fish populations and the overall food chain if discharged at elevated concentrations.

A variety of mitigation measures would be put in place to reduce these potential effects, including:

- sedimentation ponds to reduce off-site discharge of sediments
- on-site collection and recycling or treatment of de-icing fluids
- on-site and creek monitoring to ensure that off-site discharges would not affect stream habitat
- re-establishment of lost habitat, resulting in streambed improvements for spawning
- vegetative buffer strips
- natural and synthetic filters
- revegetation/stabilization of exposed surfaces
- control of instream work and watercourse crossings by construction machinery

With the exception of minor short term impacts during runway construction or construction of mitigation measures, it is not anticipated that airport expansion would have a negative effect on aquatic resources.

Terrestrial Fauna

There are large areas of natural and managed vegetation on the airport site which are restricted from public access. These lands provide a varied habitat for birds and mammals. A total of 96 species of birds were found utilizing LBPIA property for nesting or feeding areas. Three regionally rare bird species nesting at LBPIA include the Northern Harrier, the Upland Sandpiper and the Grasshopper Sparrow.

In addition to birds, eleven mammal species have been identified at LBPIA. These species included eastern cottontail, woodchuck, grey squirrel, meadow vole, raccoon, striped skunk, and white-tailed deer, American beaver, European hare, coyote, and American mink. Distribution of all mammal species was almost exclusively restricted to the valleyland areas of the LBPIA property. Only the European hare was present over a large area of the airport.

The loss of vegetated areas would mean the reduction of habitat for some birds and animals, possibly resulting in the displacement of bird and mammal species, to other parts of the airport lands. Species most likely to be affected include the regionally uncommon Upland sandpiper, the Grasshoppers sparrow, and the Northern harrier.

The European hare and wintering raptor populations would also lose some foraging, roosting and breeding habitat.

The valley lands of Etobicoke Creek represent the best wildlife habitat on the LBPIA site. A concerted effort has been and would continue to be made to keep development out of these lands. It is anticipated that approximately 85% of the valley lands would remain undeveloped and the north-south corridor that Etobicoke Creek offers to wildlife movement would be maintained. The valleylands would be fenced off to keep wildlife from the runways and it turn would limit human access to these lands.

Airport expansion would further urbanize the Etobicoke Creek, but there would be no loss of floodplain or fisheries habitat associated with the Airside Development Project. All floodplain storage would be maintained in compliance with the Metro Toronto Regional Conservation Authority's regulations and all fisheries habitat would be maintained or enhanced in co-ordination with Department of Fisheries and Oceans and the Ministry of Natural Resources regulations.

It is unknown if noise levels such as those experienced on-site at LBPIA have a negative effect on the wildlife. It is known that the airport does in fact accommodate a large diversity and population of wildlife otherwise absent from the surrounding urban setting, despite existing aircraft noise.

The present and future ecological significance of the LBPIA property is, at best, moderate given the urbanization occurring throughout the local area. Although mitigation measures would be put in place to reduce some impacts, it must be reiterated that Transport Canada must actively manage on-site wildlife to minimize the potential of wildlife-aircraft collision. The priority must be the protection of public safety.

Social, Heritage and Economic Impacts

1. LAND USE

In developing new runway options, a conscious effort has been made by Transport Canada to protect the integrity of municipal Official Plans that are based on the 1996 NEP noise contours. The runway proposal however, would result in some additional land use constraints both from the perspective of building heights under flight paths, and on a few residential areas.

In these areas, noise levels are expected to increase until 1996. It is expected that noise contours would then decrease by the year 2001 to be within the 1996 NEP.

Restrictions on building heights would occur in areas shown on *Figure 24*. Because the new runways are very close to existing runways, this restriction would not be expanded much beyond current limitations. Most of the areas affected are currently developed.

2. ECONOMIC IMPACTS

With additional runway capacity, the airport economy is expected to contribute an additional $3.5 billion in business revenue to the local economy, over the next 15 years. Accounting for the spin-off effects of this business revenue, the impact on total provincial output is expected to exceed $9 billion.

Employment impacts are expected to be sizeable as well. Locally, additional runway capacity is expected to result in an additional 3,330 jobs annually, and 3,700 provincially, for a total of over 7,000 jobs.

3. NOISE ANNOYANCE

Research has shown that single event noise impacts (maximum noise level flyover over the day - Lmax, and the noise level exceeded 1% of the time - L1), are the best measures for estimating the probability of annoyance or adverse health impacts. For the worst case year, 1996 in terms of Lmax, the highest instantaneous dBA values around 100 were forecast at most locations close to the airport. However, these occurrences would be very rare events since the typical peak noise level forecast to be exceeded only 1% of the time was significantly lower.

During the daytime this value was most often in the 60-80 dBA range while during the nighttime, the typical range was 50-70 dBA. In terms of a longer term 24 hour impact, the noise increment to the background level attributable to the airport is expected to vary from 2-16 dBA in the most impacted areas and 2-8 dBA in less impacted areas.

The conclusion from these values is firstly that in residential communities with standard home insulation, the integrity of the indoor environment should be disturbed only on very rare occasions, and then only at locations in the vicinity of the 35 NEF and above.

Outdoor activities in locations within the 30 NEF would be noticeably impacted and result in differing levels of annoyance, depending on the sensitivity of residents to airport operations.

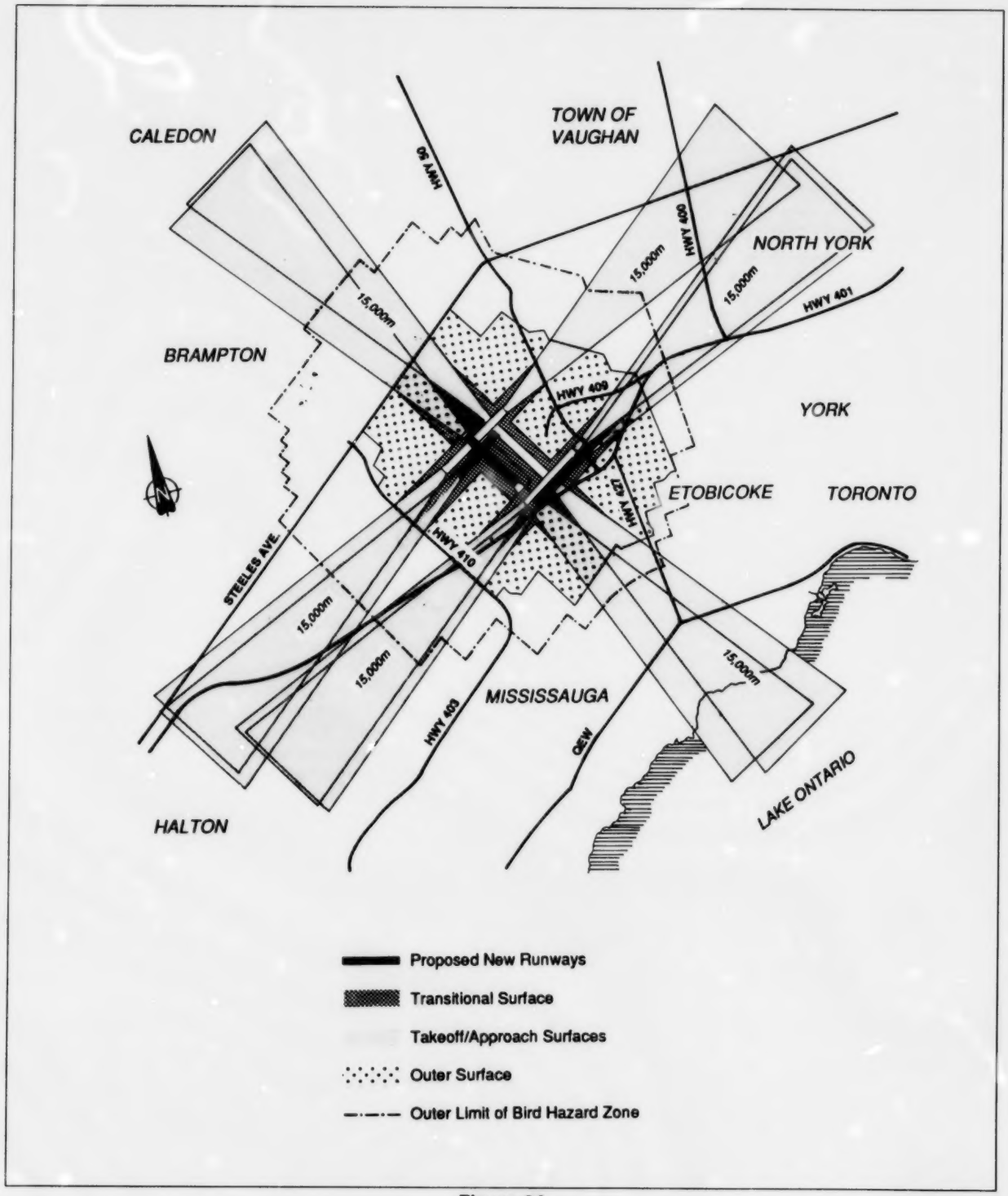

Figure 24

AREAS SUBJECT TO ZONING REGULATIONS

Noise sources not modelled, such as aircraft run-ups, can be addressed through improved operational procedures such as moving maintenance activities farther away from residential areas. Similarly, reverse thrusting would be reduced along the east-west alignments with the addition of high speed taxiway exits.

4. HEALTH

One of the primary health issues related to airport expansion is noise. Typically a change of 5 dB or more is noticeable by residents. Constant noise levels during an eight hour period in excess of 90dB are considered to be unacceptable from a health perspective. It is not expected that levels of this magnitude would be generated in residential or institutional lands as a result of the airport, either existing or expanded.

As changes greater than 2 dB would not be common, the expected change to the noise environment due to the operation of six runways would not be noticeable to most residents. Many residential areas in Etobicoke, Mississauga, North York and Brampton would experience reduced noise levels. However, as is the case with noise increases, most decreases would not be great enough (less than 2 dB) to be perceptible.

Noise effects on institutions were also studied. Institutions examined included schools, hospitals, and other government buildings. In North York the Worker's Compensation Board Rehabilitation Centre, the York Finch General Hospital and the North York Branson Hospital would all experience lower noise levels than would be experienced if the Base Case were to be implemented. In Etobicoke, the Etobicoke General Hospital, the West Humber Collegiate Institute, the Elmlea Junior Public School and the Don Bosco Secondary School, would also benefit from lower noise levels. Our Lady of the Airwaves Separate School in the City of Mississauga would experience no change in noise levels until the year 2011 when levels would drop slightly. Noise levels at our Lady of the Airwaves are not considered to be high enough at this time, or in the future, to cause any health or educational deficiencies.

The population near LBPIA, including residences, schools, hospitals, nursing homes and businesses, would not be at risk of developing hearing loss or other potential non-auditory health effects.

In summary, there is no evidence to suggest that noise due to airport operations would affect the health of representative members of the community.

A second health issue related to airport operations is air quality. The primary source of air emissions to local communities from the airport is due to aircraft queuing. Delays result in more queuing, and correspondingly higher air emission levels.

Air quality modelling predicts levels of carbon monoxide, total hydrocarbons and total suspended particulates would decrease with the proposed development.

Although emissions of sulphur and nitrogen oxides would increase, total contribution of airport emissions to background air quality are expected to decrease relative to the Base Case.

In summary, the air quality due to airport operations is a minor contributor to the area as a whole. There is no significant difference shown in air quality between the 2001 Base Case and the 2001 six runway option.

5. ARCHAEOLOGY AND HERITAGE

It is anticipated that any potential impacts to archaeological or heritage sites involved in the undertaking would derive not from the operation but from the construction of new runways.

Construction of the new runways would result in the requirement to move the Fifth Line Cemetery from airport lands. This would be done in consultation with church officials and affected family members, and would be conducted in accordance with all provincial and federal regulations.

There are several other sites of low potential for archaeological resources, which may or may not be disturbed. The quality of these sites would be monitored throughout construction. In the event that significant resources are discovered, appropriate action would be taken. The potential of discovering these resources is not expected to be significant.

6. QUALITY OF LIFE

The results of a social impact study conducted in 1990 indicate that residential communities within the NEF 30 have no greater turnover than areas in lower contours. Residents within the higher contour levels were no less prone to own homes and tended to reside in those homes as long as, or longer, than residents at lower NEF contour levels. In light of this and the demonstrated minor incremental impact of the proposed development option, it is reasonable to conclude that the social impact on the communities most likely to be affected (areas within Mississauga, Etobicoke, Brampton and North York) would be minimal.

Over the medium term to the year 2000, the growth in air passenger volumes will not differ

significantly between the Base Case and the proposed development option. Although in the absence of additional runway capacity the quality of service these passengers experience would be significantly different. Accordingly, no significant impact on the external roads and highways is expected as a result of proposed development option. The joint federal and provincial study now being conducted is addressing the transportation needs of the airport and the rapidly expanding commercial/industrial area surrounding the airport.

Transport Canada commissioned two studies in 1990 to examine the relationship between a decrease in residential property values in response to increases in NEF level. Within the Social Impact Study, no statistically significant evidence was found to support the hypothesis that such a linkage exists. A separate study of noise externalities conducted as part of the Benefit/Cost study, established a weak correlation which suggested a total decrease in property values of about $5 million for residential properties within the 30 NEP. One explanation for the lack of a stronger correlation may be the very dynamic nature of the Toronto area real estate market over the past two decades.

Social impacts on the communities most likely to be affected by airport expansion (Mississauga, Brampton, North York, Etobicoke) are expected to be minimal. Impacts from noise, air quality and economics including those on health and educational facilities are expected to be more positive than negative. The effect of negative impacts is sufficiently low that little would be subtracted from community well being and life styles.

Monitoring

Environmental monitoring programs are not new to LBPIA. Over the last two decades, noise, air and more recently water quality, have been monitored by Transport Canada. The monitoring has been carried out for a variety of reasons:

1) to provide base data on the existing environment;
2) to determine compliance with federal/provincial standards;
3) to mitigate aircraft noise and enforce aircraft flight tracks.

The present monitoring programs have been updated in an effort to provide a solid data base to measure future changes due to the addition of runways to LBPIA.

Transport Canada's commitment to monitoring is reflected in the LBPIA Environmental Management Plan. The plan is in essence an action plan for the resolution of ongoing environmental management concerns at the airport. An environmental officer would implement the plan to ensure that activities related to the Airside Development Project are monitored and are being conducted according to the standards of the appropriate regulatory agencies. The proposed environmental monitoring program would include the following categories: noise, air quality, water quality and fisheries.

A new noise monitoring system has recently been commissioned at this airport. This permits better enforcement of flight tracks and will link noise levels to specific aircraft. It will be supported by substantial increases in the fines for violations.

Transport Canada proposes to establish a fixed base air quality station equipped to continually measure CO, NO, NO_x, particulate matter, O_3, and total hydrocarbons. This station, located on the airport, would measure air quality before, during and after construction.

In addition to the Transport Canada air quality monitoring on the airport site, the provincial Ministry of the Environment also operates an extensive ambient air monitoring program. This is in integrated with the Environment Canada National Air Pollution Surveillance (NPAS) network.

All monitoring results would be presented to the airport community through the established community consultation network.

Residual Impacts

Transport Canada is committed to minimizing all impacts resulting from airport expansion as outlined in the Environmental Management Plan. Potential impacts anticipated from the construction and operation of three additional runways has been discussed in the EIS. Many of the impacts would be reduced with the implementation of appropriate mitigation measures, resulting in few residual effects.

Residual effects anticipated include:

- limited erosion and sedimentation during construction;
- maintenance of existing ammonia loadings to local creeks resulting from aircraft de-icing activities (to be monitored and treated if necessary);

- temporary loss of riparian vegetation along portions of the Etobicoke and Spring Creeks;
- temporary displacement of aquatic resources in Etobicoke Creek as a result of realignment activities, with long term improvement of aquatic habitat following construction;
- displacement of on-site wildlife resources resulting from loss of grassy habitat;
- displacement of the Fifth Line cemetery to a new location;
- additional building height restrictions within the flight path approach to the new runways;
- noise increases less than 2 dB to a limited number of residents;

Significant benefits would offset the residual impacts. They include:

- an overall improvement in stream water quality;
- an increase in fish habitat quality and quantity as a result of the re-alignment of Etobicoke Creek and application of revised standards;
- reduction of noise levels by 2001 (approximately 40% fewer households will be located in the 25 to 40 NEF contours);
- a significant reduction in carbon monoxide, sulphur dioxide and particulate matter;
- economic stimulation of the local and regional economies resulting from the creation of jobs;
- a significant improvement in the level of service offered to the travelling public using LBPIA;

Overall, expansion of LBPIA would result in some positive and negative impacts to the local area. The magnitude of the negative impacts is not considered to be of great enough significance, even in those areas most affected, to offset the positive effects of expansion. For the greater good, expansion of LBPIA is overdue. Reduced delays, congestion, and improvements to air traffic safety are benefits which would be felt across the country and throughout the air travel system.

Conclusion

In summary, this proposal for three additional runways at Lester B. Pearson International Airport provides the solution that best serves the community at large.

Study Consultants

The Environmental Impact Statement has been prepared by Transport Canada. It is based on a number of technical studies managed by Transport Canada staff.

The documentation management to produce the EIS was undertaken by MacLaren Plansearch Inc. who contracted the following sub-consultants to address social impacts, noise, biological impacts and heritage resources: Armour Environmental Consultants, J.E. Coulter and Associates Limited, S.H. Janes and Associates, Mayer Poulton and Associates Inc. and Terra Geographic Studies Inc.

The technical studies and the consulting firms that contributed to the EIS are listed below:

• ASI Inc.	Airside Analysis Study and Modelling Workshop
• Acres Internationa Limited	Study of Potential Driver and Pilot Distraction on Highway 401. LBPIA Airside Development Project (1990)
• Acres International Limited	Runway Options Evaluation Report LBPIA Airside Development Project (Preliminary Draft No. 1 - 1990) (Preliminary Draft No. 2 - 1991)
• Acres International Limited	Engineering Feasibility Study
• Aerocan Aviation Specialists Inc.	Demand/Capacity Analysis and Management Strategies (1990)
• Aerocan Aviation Specialists Inc.	Analysis of Aircraft Runway Length Requirements for Take-Off at LBPIA (1990)
• Airport Development Corporation	Terminal 3 Pearson International Airport - Traffic Impact Report April 1988
• Cini-Little International Inc.	Transport Canada, Pearson International Airport Recyclable Materials Recovery Report (1990)
• Compu Search	Population Forecasts
• Environics Research Group Limited	Air Transportation Study, December 1989
• Gore & Storrie Limited	An Evaluation of the Biological Effects of the Airside Development Project at LBPIA (1991)
• Harris Miller Miller & Hanson Inc.	Impact Assessment on Health and on Susceptible Institutions - Noise Criteria and Method of Assessment (1990)
• Harris Miller Miller & Hanson Inc.	Transmittal of Noise Monitoring Data for Permanent and Temporary Monitor Sites at LBPIA (1990)
• Hickling Corporation	Economic Impact of Alternative Traffic Management Options for LBPIA (1990)
• James F. Hickling Management Consultants Ltd.	Economic Impact Study (1989)
• Leo Middlestadt & Associates	Issues Respecting Airside Capacity and Runway Criteria: Chronology of Data (1990)
• Leo Middlestadt & Associates	Documentation Airside Capacity
• MacLaren Plansearch Inc.	Document Management to produce the Preliminary and Final EIS (1991)
• Marshall Macklin Monaoghan Ltd.	Master Plan for Parking at Terminal 3, 1989
• Mayer, Poulton & Associated Limited	Report on A Heritage Resource Assessment of the Pearson Airside Study Environmental Impact Statement (1990)

• McKnight Paul and Associates	EIS Spoke and Weather Mandated Analysis
• Mestre Greve Associates	Noise Study Area
• M.M. Dillon/McCormick Rankin	External Groundside Access Studies
• Moncrieff Management Ltd.	Demand for Aviation Services Toronto - LBPIA (1990)
• Moncrieff Management Ltd.	Long Term Forecasts of Air Traffic Demand, Toronto - LBPIA (1990)
• Price Waterhouse	Airside Social Impact Study Summary of Report Findings and Conclusions, January 1991
• Public Works Realty	Preliminary Estimates of Various Properties, Malton, April 15, 1990 (Rev. Oct. 1990)
• Rowan Williams Davies & Irwin Inc.	Airport Air Quality Policy, Modelling and Monitoring (1990)
• Senes Consultants Limited	Environmental Management Plan
• Tradewinds Scientific Ltd.	Water Quality Monitoring (1979 and 1990)
• Transmode Consultants Inc.	Benefit-Cost Analysis of Airside Development at Lester B. Pearson International Airport (1990)
• Valcoustics Canada Ltd.	Aircraft Noise Impact on Schools and Institutions, LBPIA (1991)
• R.E. Winter Associates and Gore & Storrie Limited	LBPIA Airside Development Project Impact Statement for Stormwater (1990)